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WORLD-WIDE EDUCATION

TEN BOOKS IN ONE

IN THE FOREMOST WONDERS, MYSTERIES, REVELATIONS AND TRIUMPHS OF

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3000 TOPICS

WITH

INSTRUCTION, GUIDANCE AND ASSISTANCE

IN THE REQUIREMENTS OF

PROSPERITY AND HAPPINESS, LONG LIFE AND SUCCESS

World-Wide Knowledge of the Momentous Work of the World

EDITOR

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A WORD WITH THE READER.

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THE PUBLISHERS.

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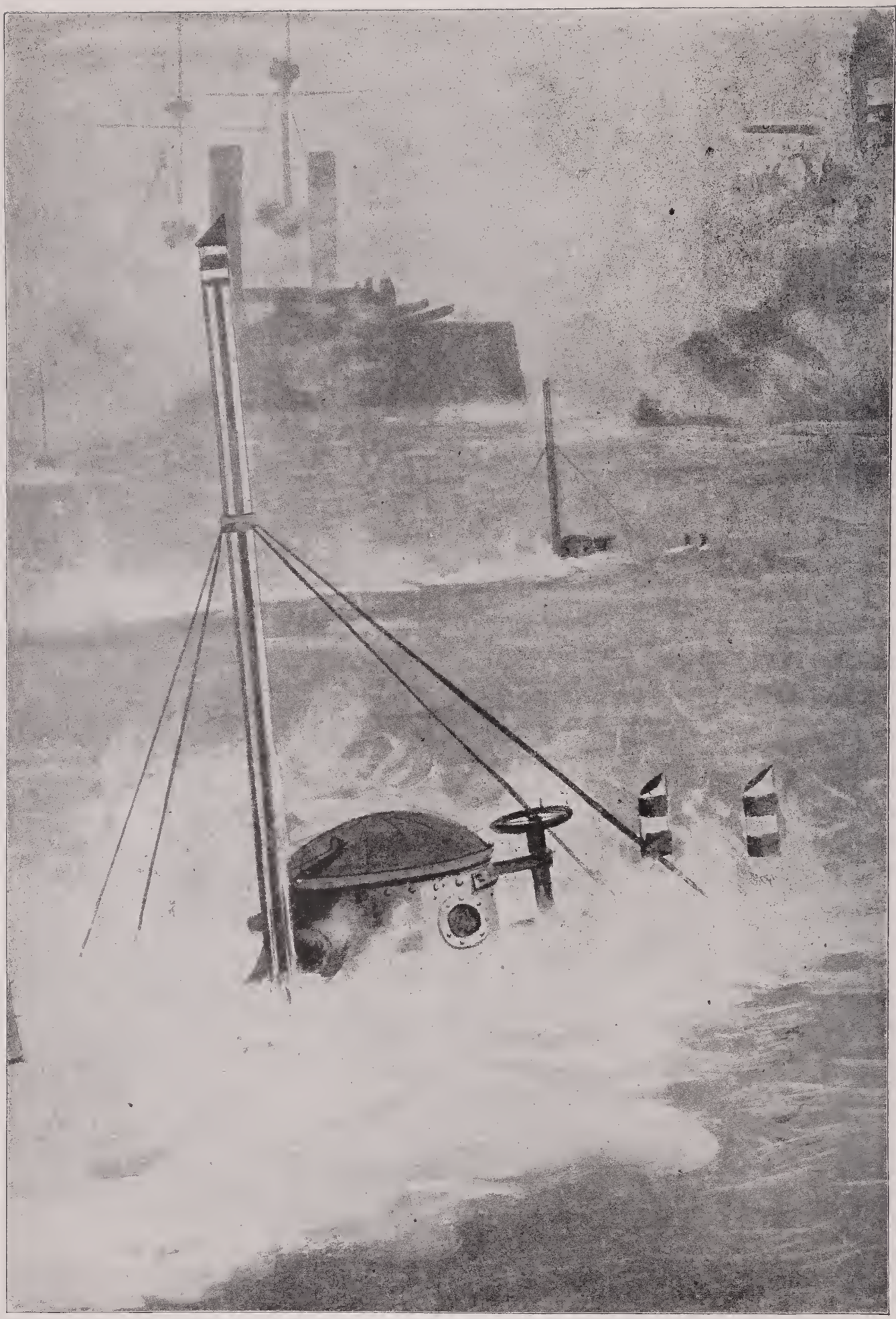
BOOK I

Revelations of Science

IN THE

MOST ADVANCED PROBLEMS OF LIFE AND NATURE

GREATEST DISCOVERIES IN THE FIELDS OF RECENT EXPERIMENT AND RESEARCH BY THE MASTER MINDS OF THE AGE



Submarine torpedo vessel rising to surface to note the destruction of a battle-ship.

Revelations of Science

STUPENDOUS AND RAPID PROGRESS OF KNOWLEDGE.

TO keep up with modern scientific progress an article ought to be written at least once every three hours. At this writing the most intense activity prevails in the laboratories of the world. The sciences that are in the forefront just now are electricity, radiation, psychology, electrochemistry and astronomy. The advances in electricity now made daily seem to prefigure and forecast the fact that the habits, customs, mode of living and civilization of mankind will all be changed by the common use of electricity. Perhaps it is not wild to say that three-fourths of the work of the world will be done by electricity—the writer believes in nine-tenths, but will say three-quarters.

ADVANCEMENT IN TRANSPORTATION.

All railways at least will be run by the still unknown agency. We say unknown, for, although the chief scientific men of the world believe that electricity is composed of Thomsonian corpuscles, rigid mathematical proof is not yet made. The building of electrical railways is now going on at a rate so rapid that one cannot follow the details. No such colossal movement of capital, advanced by the leading financiers of the world, in so short a time has appeared in history. Southern California is simply being covered by a network of almost perfect electric railroads. The Huntington system is not surpassed in the United States. Ohio is being traversed in all directions, and so is Massachusetts.

The gigantic tunnel under the Hudson River from Jersey City to New York is gradually nearing completion after thirty years of toil. Electricity only will be the motive power for the cars. The immense underground railways under the City of New York are all actuated by electric currents. Steam railways are being turned into electric in many parts of the world where water power is plenty.

If a buzzsaw is in rapid motion it seems to be at rest. And this idea may apply to progress, for it is so rapid that the observer is dazed and confused, and the panorama, so far as he is concerned, might as well be quiescent—he fails to comprehend.

AMAZING FEATS OF CONSTRUCTION.

Since old King Sulphis put up his big pyramid no such feats of engineering have been consummated. The new bridge between New York and Brooklyn is one of the most sublime works ever wrought by human hands. In fact, the vast city, New York, is now one great centre of

magnificent engineering. This bridge took seven years to build, and every cable, bolt, brace and stone was first in the clutch of mathematics. One sight of the formulas of the higher analysis in computing the strength of materials, strains, pressure, pushes and pulls is enough to cause one's brain to whirl. The genius of man was called into play to swing the enormous cables. Vast anchors were buried deep into the earth in New York and Brooklyn to keep the cables from sagging. They alone—the anchors—cost $1,570,000, the total cost of the bridge and land terminals being over $20,000,000. Its length over the river between towers is 1,600 feet, and the width of the floor is 118 feet. Two steam railroads, four electric, two roads for horse carriages and two for foot passengers fill this elevated aerial street.

A system of running railway cars at great speed at low cost has just been devised in Berlin. The problem seems to have been solved in this case by means of alternating currents at high pressure, which can be transmitted on a small wire at lower cost than direct low pressure. Vast and world-wide changes will be made in electrical railways the moment that alternating currents can be sent directly into the motors under the cars without the present expensive cost of transformation of low direct into high alternating. Really, it will change the transportation problem of the world.

Another gigantic work of engineering is that of the Edison Portland Cement Works. He crushes stones in the great rollers that in many cases weigh five tons each. The use of Portland cement in our giant buildings is rapidly on the increase.

MYSTERIES OF RADIATING ENERGY.

In radiation the world is continually being startled with the discovery of new waves of many varying lengths that issue from almost every object. In fact, it is now thought that energy waves emanate from every phase of matter. The difficulty so far has been to make apparatus delicate enough to detect them and measure their lengths. Waves that are set up by the human body and brain are easily detected at present. The wave question is now immense; for one brain devoting all the time can scarcely follow the rapid strides. Wireless telegraphy is intricate enough to take the entire attention of any one desiring to know how daily papers, printed on steamers in mid-ocean, receive the news.

The lengths of the waves of electric disturbance, ordinarily used in wireless transmissions, range from 460 to 3,600 feet. The length of sound waves, commonly employed in music, vary from two-fifths of an inch to thirty feet. The shortest wave of light that can be seen by the human eye runs 64,000 to the inch and 33,000 for the longest.

Radium, Rontgent and Blondlot waves are still shorter than the shortest waves called light. The Blondlot are the "N" rays, which have been found streaming forth from the human body.

STARTLING SCIENCE OF MIND.

Psychology, the science of mind, is now attracting the attention of many of the most intellectual men of the world. Its study is spreading faster than that

of any other science, except electricity. The human mind is now known to be an engine of the most intricate complexity. Its labyrinths are now being explored deep. The star Antares, the red star now in the Southeast at sunset, in Scorpio, has been weighed by Astronomer Gore of England. It contains 88,000

A bare volcanic stump, known as the Wyoming Tepee, and probably one of the oldest geological points on the American continent. Only the core showing basalt in columnar form remains, the ash-built slopes having been completely worn away by the action of the weather.

hourly in this country and in Europe.

Astronomy is expanding. Sounding lines of mathematics are being sunk into the most appalling depths of space. Here is one of the things dragged from the times more matter than our sun, and it contains 333,000 times more than is in the earth. By multiplying one can find how many worlds like this earth could be made out of the giant sun Antares.

THE RELIGION OF SCIENCE.

We find ourselves born, without choice of our own, into a universe which we do not understand, and which corresponds, as it seems, only in the most imperfect and fragmentary way with those of our desires and aspirations which we increasingly believe to be legitimate and good. From this universe we are removed, as we entered it, without notice or warning, and without any reference to our willingness or unwillingness to depart. Before departing, we have, commonly and without much reflection, produced others to undergo in their turn the same enigmatic destiny. And so from generation to generation the race is continued; achieving much, yet accomplishing nothing; learning much, yet remaining ignorant of everything; acting, thinking, feeling, yet haunted by the doubt whether it is not all a dream; pursuing Good and contending with Evil in a scheme of things which never appears itself to take sides; developing the means to happiness, yet never becoming happier; pressing ever onward to goals that are never reached; and retiring, section after section, baffled but never acknowledging defeat, to make room for new combatants in the contest that is always old.

THE RELIGIOUS INSTINCT.

Suppose a man to have accepted—as many now have, provisionally at least—the view which seems to be suggested by modern science: that the world, as a whole, is neither good nor bad, but simply indifferent to moral values; that the life of mankind is but a brief and insignificant episode in its strictly determined but purposeless activity; that it tends to no goal having ethical significance, still less to one corresponding to our conceptions of Good—suppose a man to have accepted this, is he, therefore, debarred from religion? Surely not. On the contrary, there would seem to be open to him two attitudes at least, either of which he will adopt, according to his character, if he has the religious instinct at all; and either of which may be fairly called religious. Thus he may, adhering passionately to our standards of value (none the less true because their realization is so imperfect and precarious), pursue, wherever it flees, the perishing image of Good, imprisoning it in a rule or a policy, impressing it on a fugitive act, embalming it in the flux of feeling, reflecting it in the mirror of art, always from the consciousness of frustration drawing new vigor for the chase, snatching defiance from the sense of defeat, patience from the fire of passion, from the very indifference of the universe gathering the inspiration to contend with it, and, though at last he be broken, perishing unsubdued, weaker yet greater than the blind world which, though it made him and destroyed, was incapable of understanding or valuing its own creation.

A BAD OR INDIFFERENT WORLD.

Such a man, sustained by such a conviction, honestly held, I should call religious, as Prometheus was religious. And if to some he should appear rather to be blasphemous, that will be only because they do not share what I have supposed to be his intellectual position. Granting a bad or indifferent world, to defy it will be a form of religion. But

not the only possible form, even on that hypothesis, for where one man practices defiance, another may practice renunciation; and the conviction that Good can not be realized, or can be realized, if at all, only in connection with greater Evil, may lead to the creed of the annihilation of desire, instead of the affirmation of will. Escape, not battle, then becomes the goal, as in the Buddhist faith, and the philosophy of Schopenhauer and Hartmann. And this attitude, too, will be religious, if it be greatly and imaginatively conceived; religious not by virtue of its intellectual content, but by virtue of its sense of a world-issue turning upon the ideas of Good and Evil.

But now suppose a radically different scientific conception of the world. Suppose it to be believed that our ideas of Good and Evil are also those with which the universe is concerned, that it is moving toward a goal, and a goal of which we approve, that with it moves the human race, and even individual souls, surviving death and ultimately entering into their perfection. On this view, religion assumes a radically different complexion. It is optimistic instead of pessimistic; it has exchanged the horror of night for the midday sun. But it is still religion; for its essence is still the same; an imaginative conception of the universe, as a whole, in relation to Good and Evil.

SCIENCE NOT THE ENEMY BUT THE ALLY OF RELIGION.

The world hears a great deal about the impossibility of reconciling religion and science, and the unthinking are apt to deduce from the phrase the idea that geology and evolution and the X-rays have driven God from the world.

It is true that the geologist's hammer and the biologist's patience and the astronomer's telescope have shown that the Jewish cosmogony set forth in the Bible was fanciful. But religion does not depend for its existence upon the legends of an Asiatic race.

WHAT IS RELIGION?

Religion consists in the belief that there is a universal plan behind the visible universe; that co-existent with the world of our five senses there is another, finer, less material, or more spiritual (as one may choose to phrase it); and that, comprehending the world seen and the world unseen, there is a power, in Matthew Arnold's phrase, "a power not ourselves that makes for righteousness."

For this belief compels the faith that our lives do not end here, and therefore it is our duty to improve ourselves in harmony with the universal plan, which is all there is of ethics; and faith and ethics are religion.

All the articles of this necessary belief are established firmly by modern science, not controverted and destroyed. Nobody who knows the phenomena of electricity, for example, to say nothing of the Roentgen rays and the radiographic activity of the newest discovery, radium, dare assert that the material, the visible, the tangible—and these only—have existence.

ACCOUNTABILITY OF THE SOUL.

These things do not prove that there is a human soul, but they make it im-

possible longer to deny that there may be one, accountable and immortal.

Nobody who is familiar with the discoveries of evolution can deny that there is a universal plan, indicating a design having an omnipotent designer.

This may not prove there is an omnipotent intelligence behind it, but it makes it impossible to deny that there may be.

In every respect the recent researches of science, instead of weakening man's reasons for faith and ethics, which are religion, have strengthened them, if not fortified them against all assault.

Science has made atheism seem idiocy and has forever banished materialism from human thought.

MAN AND THE UNIVERSE.

If the reader is in a room twenty feet long, twenty feet wide and twelve high, then a computation may be made as follows: Suppose the reader to have a little box one inch in length, one in width, and one in height. Let the interior of the box be a perfect vacuum. Then drill a hole about one-thousandth of the diameter of a hair, and admit air. Let the air rush in until the box is filled to the same pressure within as without. And let the current of air carry in 1,000,000 pieces of dust through the narrow opening, then it can be well imagined that each dust particle is very small. The box would hold many more millions of motes, for the air inside is that ordinarily taken into the lungs at every breath; indeed its purity is greater than that inhaled in cities.

FROM LITTLENESS TO NOTHING.

But, with only one million in a cubic inch they are so minute that no human brain can even begin to think of how small they are. To tell the diameter of one would be useless, for the mind would still be unable to form any conception of a dimension so insignificant. Languages might be searched to find a word that would describe one of them. No word could be found, but there is one that comes very near giving an impression from one mind to another. That word is nothing.

The nearest neighbor our sun has is another similar to it; the star—actually a sun—named Alpha Centauri. Its distance is twenty-five trillion miles. A trillion is one million million. Our sun —a little star really—is therefore monarch of a sphere whose diameter is twenty-five trillion miles.

The diameter of the earth we call our home is known with great accuracy; perhaps within an error of one thousand feet. This, of course, gives its volume equal precision. Therefore the volume of the cosmic sphere, of which our sun is the center divided by the volume of the earth, shows how many times the sphere is larger than the earth. It is 3 followed by twenty-eight naughts times larger; a number so utterly beyond brain power that any attempt to think of it is useless.

But with one million particles of dust to the cubic inch, the room would contain eight followed by twelve naughts. Divide one of these numbers by the other, and the quotient is four quadrillion. That is, each space dominated by a piece of

dust in the box is larger in proportion to the size of the room than the entire earth is to the sphere dominated by the sun.

INCONCEIVABLE SMALLNESS OF THE EARTH.

Search all languages for a word to tell the smallness of the earth, and not one can be found so accurate as the word nothing.

Let us now put in dust until the box is filled and assume that all air is excluded, and that one hundred million particles are required. Then each is forty million times larger in relation to the volume of the room than the earth is to the sphere of space surrounding the sun, having the minute diameter of twenty-five trillion miles. For the distance of the sun's nearest neighbor is known within the limit of small error.

No mental power of man in his present scarcely trained and barbaric condition is able even to begin a series of coherent thoughts on this mighty maze of figures. For let a mind be trained now to a degree of culture the highest at present attainable, such as that reached by the great French and German mathematicians — where one mind knows more of nature than ten million other selected minds— attack these vast numbers, then it would be overwhelmed in a moment.

Research in this note, trying to find how small the earth is, has scarcely commenced yet; for, although the space sphere, having a diameter of twenty-five trillion miles, is large enough to contain thirty octillion worlds like the earth, the appalling fact now looms up—this colossal sphere itself, to be described with near approach to accuracy, would require the use of that short, simple, easily remembered, impressive, all-potent word nothing! It comes in at the critical time when searching for words, and suits the case admirably.

NOTHINGNESS OF THE EARTH.

This may be cleared thus: No mind— not even of the ablest mathematicians, where one man knows more than ten million others—would be powerful enough to traverse vast wildernesses, broad expanses and complex labyrinths of figures and detect the difference betwen these two sentences: The earth is nothing and the earth is next to nothing.

So far the dimensions of the earth have been compared to space fairly well known to modern astronomy; but if it be compared in mass to the mass of matter now known to be in existence, the earth again emerges from a sea of mathematics so unutterably and indescribably small that the mind actually finds relief from stress and tension always experienced in these investigations by summoning to our aid the quieting and soothing word— nothing. But the earth is man's place in nature.

THE SIZE OF AN ATOM.

How large is an atom? Perhaps the simplest though not the most exact way of arriving at a rough estimate of the size of atoms is by measuring the thickness of a soap-bubble film, where it is as thin as possible just before it bursts. Such a film, if composed of atoms, must be something like a pebble wall. Now a pebble wall would not stand if it were not several pebbles thick and if we had reason to suppose that it was about a dozen pebbles thick we could

easily make an estimate of the size of a pebble by measuring the thickness of the wall. That is the case with the thinnest region of a soap film. It is found to have a very definite and uniform thickness. It is the thinnest thing known and by refined optical means its thickness can be accurately measured. It must contain not less than something like a dozen atoms in its thickness and yet it is only about the twenty-millionth of an inch in thickness by direct measurement. So that the diameter of an atom comes out between one two-hundred-millionth and one three-hundred-millionth of an inch. In other words from about 200,000,000 to 300,000,000 of atoms can lie edge to edge in a linear inch.

THE SMALLNESS OF THE VISIBLE UNIVERSE.

But here we are all at sea, for psychologists have discovered that the human mind in its current and passing phase of evolution from primordial consciousness in the remote past, to approaching and limitless reason in the distant future—is unable to think of the meaning of the word nothing. It is, of course, scarcely accurate to say that a sphere of space twenty-five trillion miles in diameter bears so minute a relation to space now known to astronomers that the proportion could be included under the word nothing. What we mean to say is that in comparison the dimensions of the sphere is next to nothing. This has an approach to precision. For from star gauges, photometric determinations, proper motions, computations and estimates, modern critical research has led to the conclusion, a conclusion whose limit of error may probably be set within twenty per cent, that the portion of the sidereal structure visible in the largest telescope has a diameter so enormous that light moving 186,000 miles during each second of time requires 30,000 years to traverse it.

A sphere with this diameter is 350 billion times larger than the microscopic sphere of only twenty-five trillion miles in diameter. So the little sphere controlled by our sun is not strictly nothing, but is very near it. Call the celestial sphere 300 billion times larger than the little one, allow fifty billion for mistakes in measuring these brain-stupefying distances, then the final result, so far as the size of the earth is concerned, is not changed.

HOW STARS ARE MADE.

The immensity of the abyss that separates us from stars about which planets might revolve prevents us from gathering evidence of the existence of other systems—stars so large and brilliant that, compared with them, our sun, if transported to their distance from the earth, would appear no bigger than a coin a thousand miles away. Even a telescope many times more powerful than the instruments now mounted in observatories would not help the astronomer where the distance between him and the hypothetical centre of a remote solar system is such that the light of that centre, traveling at the rate of 186,000 miles per second, reaches us only after the lapse of centuries; so that we see the star not as it is now, but as it was hundreds of years ago when Columbus discovered America.

Gods and devils of mankind. Complete collection from the principal religions.

Obviously, the evidence supporting the doctrine of the primeval cloud must be gathered by means more exquisite in their refinement than the telescope alone provides.

The light of the sun, as everybody knows at this late day, consists of many hues, some brilliant and others dull, all of which united form a white glare. The separation of the sun's white light into its constituent colors and lines—its spectrum—is accomplished by prisms of glass.

SODIUM IN THE SUN.

It was discovered rather late in the last century that each of these colors, or groups of colors, or lines, were produced by glowing chemical elements. A grain of common table salt—sodium chloride—heated to incandescence in the blue flame of a Bunsen burner, exhibits a spectrum in which a yellow tint is the predominant feature. That yellow tint is characteristic of the element sodium; it always appears in the same place when seen in the spectroscope. The same yellow gleam appears in the spectrum of the sun exactly in the same position. What better evidence can there be that the metal sodium is contained in the sun?

Thus the spectroscope has enabled the astronomer to determine not only what known metals and gases are glowing in the sun, but even what unknown elements are contained in the centres of our solar system. And thus it becomes a matter of no great difficulty to analyze a star chemically with the utmost nicety, although separated from us by a chasm that can be measured only by millions of miles.

AGE CHANGES SPECTRUMS.

A body that has just condensed from the original mist will have a spectrum quite different from that of a body ten million years older; and this older body will in turn exhibit a spectrum unlike that of an orb still more aged. Just as the ancestry of the modern horse is traced through the many-toed skeletons of his geologic forefathers, so the life-history of a star is traced by stellar spectra. The groups of colors and lines that distinguish each glowing celestial body can be arranged in a series as orderly as that of prehistoric equine skeletons.

From the spectroscopic study of the heavens it has been concluded that the cloud-like masses known as nebulae are the stuff of which stars are made. Each nebula is a fiery mist which, as the ages go by, congeals into a star. So far has congelation progressed in some of these glowing mists that they have been called by astronomers "planetary nebulae."

In the constellation of Orion a planetary nebula is found in which a brilliant spot may be seen, consisting in reality of four stars, all of them suns probably as large as, if not larger than, our own. Those four suns tellingly exemplify the development of a star. That they constitute a system of their own cannot be questioned; and that they were formed by the draining of the primeval mist is amply proved by the empty blackness of the nebula immediately surrounding them.

NEBULA OF ORION.

Examined by the spectroscope, the nebula of Orion is found to consist of an enormous volume of incandescent gas,

partly hydrogen, partly nitrogen, partly an unknown gas; and in this great volume of gas stars are plunged. When it is considered that the gases of which the four stars in question are constituted are exactly the same as those of the nebula itself, we can no longer doubt that in Orion may be found a most wonderful example of stellar evolution.

That nebulae are really composed of gas and that they may be considered early stages in stellar evolution, are discoveries due to Sir William and Lady Huggins. Before their epoch-making investigations it was supposed by many an astronomer that nebulae were in reality only vast numbers of stars clustered together so closely that they appeared as a haze in the sky. That supposition was not without some basis in fact. Viewed through a small telescope many a star cluster is simply a blur of light that might well be mistaken for a nebula; but in a powerful instrument the blur is resolved into independent stars.

SPECTROSCOPE DECIDES QUESTION.

Chemical analysis by Sir William Huggins' spectroscopic method has settled whatever dispute there may once have been, and has rendered it possible to determine which masses are really nebulae and which only clusters of closely packed stars. The composition of a star cluster is as different from that of nebula as water from iron.

Like flowers and animals, nebulae differ much in size, form and appearance. Some are extremely irregular, like the nebula in Orion; some mere wisps of light, like the nebula in the constellation of Cygnus; others so well defined in shape that they are mistaken for comets, like the nebula in Andromeda; still others are ring-shaped and filled with milky light. Most remarkable of all, perhaps, are the spiral nebulae, an admirable example of which may be found in Canes Venatici. The primordial mist may possibly have assumed some such spiral form. At all events, recent investigations seem to prove that in the spiral nebula we see a very early stage in the process of condensation.

Because the spectroscope is able to distinguish an incandescent gas from a partially condensed starlike mass, it is possible to ascertain how far congelation has progressed and how advanced a star's development may be. The relative intensities of spectrum lines render it possible to estimate the temperature of a distant blazing sun, and the width and sharpness of the lines the pressure to which the vapors of that sun are subjected.

REVEALS MANY SECRETS.

Thus it happens that the spectroscopic analysis of a star—which even through the most powerful telescope must appear only as a brilliant point—reveals to us secrets of its structure that the astronomer of half a century ago despaired of fathoming.

As a star contracts from the surrounding nebulous matter its temperature rises, and with this augmented heat occurs a change both in the star's spectrum and color. Red-hot iron is not nearly so hot as white-hot iron. By observing the various changes in tint which the metal undergoes the foundryman is able to tell

with considerable accuracy its degree of heat. A somewhat similar method of gauging a star's temperature, and therefore its age, is relied upon by the astronomer. Color, then, and spectroscopic analysis enable the astronomer to estimate the age of orbs that are only beginning to exist as stars, and others whose light is fast fading.

After having coagulated, as it were, from a nebulous mass a star assumes a color that may be best described as an intense bluish white, much like that of the electric arc. Stars of that hue are, therefore, in their infancy. Then comes the white stage, followed by the yellow, orange and red, each succeeding hue indicating greater celestial antiquity than the last.

GRADUAL COOLING BEGINS.

Up to the yellow period the star as it contracts grows hotter and hotter. Then a gradual cooling takes place. Accompanying the changes in color are changes in the spectrum of the star—changes that indicate a modification in physical structure. In the bluish white period of a star's infancy the characteristic wide lines of hydrogen gas predominate in the spectrum. As the color changes, the lines of calcium, magnesium and iron appear, the hydrogen lines gradually becoming thinner and those of calcium broader.

At what stage in its evolution does a star reach its highest temperature? Astronomers are not altogether in accord on the point. The singular law which paradoxically holds that, as it cools and contracts, a star grows hotter up to a certain point, coupled with Sir William and Lady Huggins' explanation, would seem to point to our sun as the hottest type of star. To be sure, the sun is not bluish white. But the sun's atmosphere has much to do with its color. Indeed, if that atmosphere were not present the solar spectrum would be two and one-half times brighter at the blue violet end of the spectrum.

MEASURES HEAT OF STAR.

Armed with an instrument so delicate that it could measure the heat radiated from a man's face one-half a mile away, Professor Nichols of Yerkes observatory has measured the heat sent to us by Vega and Arcturus, stars so remote that it would take a terrestrial express train, traveling at the rate of sixty miles an hour, nearly 3,000,000,000 years to reach Vega, the nearer, from Arcturus, removed from the earth six times the distance of Vega, we receive as much light as we would from a candle six miles away. Such delicate measurements have led to the conclusion that Vega is still a young star, that it sends us less heat than Arcturus—although it is hotter—and that Vega, eras hence, will develop into a body like our sun.

After a star has passed the stage which our sun has now reached, the metallic elements in its structure increase in number and importance, while the gases dwindle away. As the star reaches the red stage carbon becomes particularly prominent in its spectrum. Ages must still elapse before the star ceases to be self-luminous and then is converted into a gigantic, blackened cinder rushing through space. Of the development that follows, the planets above us, and our own earth, afford striking examples. The last and most pathetic period is represented by our moon —frozen, desolate, dead.

SCIENCE AND THE COMMON MAN.

When the spade of the western student uncovers in the deserts of Asia and northern Africa the long-hidden ruins of a city of antiquity, the world is amazed by the wonderful monuments of an advanced civilization thus disclosed. We see that thousands of years ago, in the very dawn of history, kings had palaces and capitals which rival in splendor the palaces and capitals of modern times.

Artists and engineers were guided even then by the highest principles known today. The pyramids of Egypt are a riddle to our mechanical science.

On a barren island of the Ægean sea we found the Venus of Milo, and we set it up as the great model for contemporary sculpture. In the wilderness of ruins on the Acropolis at Athens twentieth century architecture finds its most valuable object lessons.

The Old Testament is the fountain from which we draw our moral philosophy, and it holds besides much of our natural science. Homer remains the unapproached master of poetry; Phidias and Praxiteles of sculpture and Michel Angelo and Raphael of painting.

HUMAN ACHIEVEMENT.

No one can look upon those glorious landmarks of human achievement without admiration for the times which produced them, and few can look upon them without asking themselves where is the progress of which we boast?

If the world really has advanced in this age-long interval, where are the certain signs of that advancement? We do not flatter ourselves that great men have grown greater since Alexander; that wise men have grown wiser since Solomon; that heroes are grown more heroic since Horatius; that the race has increased in beauty since the Venus of Milo and the Apollo of Belvidere were modeled 2000 years ago. Modern progress cannot stand these tests.

Our Christian era cannot out-match pagan antiquity in personal distinction, in individual greatness. With all the thought we have taken we have not added one cubit to the human stature.

SIGNIFICANCE OF INVENTION.

Some there are who seem to think that the grandest achievements since the world began are the telephone wire to the butcher's and the trolly car down town.

Many of these "modern improvements" have their deep importance, but only as the means to an end. They are not in themselves the monuments of our progress. No archæologists of the sixtieth century will be able to discover a trace of them in the ruins of our civilization. They are convenient, but not glorious.

THE COMMON MAN.

Will not the common man be the glory of our age? Of the advance which he has made we are certain. It is the greatest fact of all history. However sceptical we may be of our progress in other directions we cannot doubt that the world of common men has "widen'd with the process of the suns."

Whatever the pyramids were designed to be they are monuments of the labor of slaves. All the temples and palaces, yes, and the cathedrals of other days,

were cemented with the blood and sweat of serfs.

We could not build them now. Men are not cheap enough. With an eight-hour day and the union scale, one pyramid would have been quite enough for an Egyptian king. But between rearing pyramids and rearing men most of us would choose to live in an age distinguished for the latter.

RULE OF THE FEW.

Until our own times all the affairs of the world were ordered by and for the few. The many were silent, and hardly more considered than the beasts of burden.

This was not so much because the upper classes were more unfeeling than they now are; but because they regarded the masses as condemned to a hopeless wretchedness. Laborers bent to their tasks from sunrise to long after sunset and received a wage merely sufficient for their bare existence.

As late as the year 1858 Rhode Island wool spinners worked eighty-four hours a week. To work thus six days of fourteen hours each, with half an hour off at noon, it would be necessary to begin at 6 in the morning and stay until 8:30 in the evening.

ELEVATION OF THE COMMON MAN.

If under such circumstances there was no faith in the capacity of the common man to rise, who can wonder?

Political economy held out no hope of making the condition of the masses better and was devoted to "the dismal science" of calculating the necessity, whenever they became too numerous for their masters, of killing them off by war and pestilence. Even in our own day, just thirty years ago, Professor Cairnes, one of the foremost of the British political economists, wrote of the working people: "The problem of their elevation is hopeless. As a body they will not rise at all."

THE GREAT PROBLEM OF SOCIETY.

When, however, as Emerson recorded, "God said I am tired of kings," civilization turned to the only untried element in its composition, the common man, and made him the cornerstone of modern institutions.

"The class which has hitherto ruled Great Britain," said John Bright, "has failed miserably. It revels in power and wealth, while at its feet lies the multitude which it has neglected. If a class has failed let us try the nation. That is our faith, that is our purpose, that is our cry —let us try the nation."

So in this faith the common man has been called in to be the master of the state and the architect of national destiny. The uplifting of the masses has become the first problem of society.

TWO VIEWS OF MAN.

We have from two distinguished sources rear and forward views of man, and it is to be regretted that from neither standpoint is there much reason why the highest of creation as he exists today should vaunt his pride. The past robs him of part of his glory, and the future holds the awful possibility of his reduction to second place in the animal kingdom.

First, we may travel back a few thou-

sand years with the famous Assyriologist, Professor A. H. Sayce, whose words have the weight of authority. In reading the facts of the ancient monuments he finds that the oldest inhabitants were really very gifted persons. Egypt and Babylon had their literary activities, their great libraries and their strenuous politics. "We have learned many things of late years from archaeology," he writes; "but its chiefest lesson has been that the age of Moses, and even the age of Abraham, was almost as literary an age as our own." Of course, the writers of those times did not have to send return postage on their manuscripts—it would take a few bushels of 2-cent stamps to get back a hieroglyphic slab—but they wrote as persistently and quite as well as the people of today. So why should man boast of his progress during the thousands of years that have come between?

But that is not the worst. H. G. Wells, who has dipped into the future far as a novelist's eye may see, and who makes it pay, delivered before one of the important scientific associations of England this year a serious and able address on "The Discovery of the Future." Near the end he made the remarkable declaration that he did not think much of man, and he went on to say that if evolution had produced him from its long labors, starting with the lowest form and building up to the present biped, there was excuse for believing that at some great moment in the distant future it would find a higher expression of its handiwork.

So there he is—a clothes-wearer, trolley-chasing animal, whose thoughts are little better than they were in Abraham's time, and whose ultimate fate may be the monkey's place at a Newport dinner!

WOMAN AS THE SUPERIOR OF MAN.

Dr. William T. Belfield says: "In the lower organisms the female eats the male. A little higher up in the scale of evolution the female discovers that the male can work and supply her with food, while she reproduces the species. As a worker the male developed certain qualities unknown to the female—qualities that are especially developed in the very highest animals, the human race.

"But the female remains, even in the human species, as the conserver of the race and the depositor of all the virtues that render society possible and that perpetuate human culture.

WOMAN'S SUPERIOR QUALITIES.

"Woman is superior, mentally and physically, to man. She endures more and is less subject to the diseases caused by the ravages of microbes in the human system. For every 105 boys born there are 100 girls, yet when the period of infancy has elapsed, with all the losses due to infantile diseases, the number of females equals that of the males. The longevity of women is greater than that of men.

"To prove the superiority of women mentally consider the matter of color-blindness. Perception of color is the last attainment of the human optic; it is the most subtle finality of human evolution. Out of every 100 women one is afflicted

with color-blindness. Out of every 100 men sixteen are afflicted with color-blindness. Boys born of a color-blind father and a normal mother will be color-blind, but girls born of the same union will have a perfect perception of colors.

HOW OLD IS THE EARTH?

The time has admittedly gone by for attempting to "reconcile the facts of Nature"—to use a recognized phrase—with the chronology of the Bible, which makes the age of the world rather less than 6,000 years.

Indeed, in the Egyptian Rooms at the British Museum, the visitor can see for himself objects which go back to an authenticated period long antecedent to 4000 years B. C., and great is the wonder produced on the minds of those who first make their acquaintance. In that same department, among the mummies, there is what is in many respects the most striking of the exhibits in the department —the body of a man who belongs to the Stone Age. It lies in an accurate representation of the peculiarly shaped grave in which it was found, and it has been in consequence somewhat irreverently nicknamed by the habitués of the Museum "the man in the pie-dish."

A RELIC OF 5000 B. C.

The particular interest in that corpse —which men, women, and even children look upon without the least thought or suggestion of the fear or horror usually inseparable from death—is that it is unquestionably the oldest exhibit in the Museum; and scientists have been rather struck by the fact that the authorities of the great institution in Great Russell Street have not, so to say, taken the bull by the horns, and boldly labelled that exhibit at dating from 5000 B. C. Thus, with one single stroke of the pen, Bishop Usher's Biblical chronology is enlarged through centuries unknown to satisfy the requirements of the age of that particular specimen.

How long has the earth been a planet capable of supporting not only human but all forms of life?

In an address Lord Kelvin once delivered on the subject, he gathered together the opinions of various scientific men, which cannot but be of interest to every thinking being. Darwin, in his "Origin of Species," stated that "In all probability a far longer period than 300,000,000 years has elapsed;" while later on, in the same book, he wrote: "He who can read Sir Charles Lyell's grand work on the 'Principles of Geology,' which the future historian will recognize as having produced a revolution in natural science, yet does not admit how incomprehensibly vast have been the past periods of time, may at once close this volume."

WHEN THE SUN DIES.

Lord Kelvin himself—then Professor William Thomson—over forty years ago, made an attempt to calculate the length of time during which the sun has been burning at its present rate, and in that connection he wrote: "It seems, on the whole, most probable that the sun has not illuminated the earth for 100,000,000 years, and almost certain that he has not done so for 500,000,000 years. As for the future, we may say with equal certainty

Church with a modern front but whose walls are the oldest in the boundaries of the United States, erected for Christian worship.

that the inhabitants of the earth cannot continue to enjoy the light and heat essential to their life for many million years longer, unless new sources, now unknown to us, are prepared in the great storehouse of creation."

It is a remarkable evidence of the acute perception of Lord Kelvin's mind, as of the rare prevision of his intellect, that the last words—"unless new sources, now unknown to us, are prepared in the great storehouse of creation"—should have been added to that remarkable sentence.

As an example of the very extraordinary range of time given to the age of the earth, consider the following statement from Professor Jukes' "Students' Manual of Geology." He wrote: "Mr. Darwin estimates the time required for the denudation of the rocks of the Weald of Kent, or the erosion of space between the ranges of chalk-hills, known as the North and South Downs, at three hundred millions of years. It may be possible, perhaps, that the estimate is a hundred times too great, and that the real time elapsed did not exceed three million years; but, on the other hand, it is just as likely that the time which actually elapsed since the first commencement of the erosion, till it was nearly as complete as it now is, was really a hundred times greater than his estimate, or thirty thousand millions of years."

96,000,000 YEARS OF LIFE.

Professor Phillips, in a lecture to the University of Cambridge, considered the rate of erosion between the ranges of the North and South Downs to be rather one inch a year, than Darwin's estimate of one inch in a hundred years, so that on mere geological grounds he reduced the times to about a hundredth. Calculating, however, the actual thickness of all the known geological strata of the earth, he came to the conclusion that life on the earth's surface may probably date back to between thirty-eight and ninety-six million years.

Within the last ten years, Professor Sollas, of Oxford, working on new principles applied to the stratified rocks, reduced this time very considerably, for he wrote: "So far as I can at present see, the lapse of time since the beginning of the Cambrian system is probably less than 17,000,000 years, even when computed on an assumption of uniformity, which to me seems contradicted by the most salient facts of geology."

STARTLING FIGURES.

What are the data, it will naturally be asked, on which calculations of this magnitude are made? Among the most important are the consideration of the underground heat which is constantly being conducted out of the earth—in other words, the cooling of the earth, the speed at which the earth rotates on its axis, as well as physical properties of rocks at high temperatures.

The loss of heat by conduction was Lord Kelvin's first argument for limiting the age of the earth. He found that if the earth had been losing heat in the past "with any approach to uniformity for 20,000 million years, the amount of heat lost out of the earth would have been about as much as would heat, by 100 deg. C., a quantity of ordinary surface rock of 100 times the earth's bulk. This

would be more than enough to melt a mass of surface rock equal in bulk to the whole earth. No hypothesis as to chemical action, internal fluidity, effects of pressure at great depth, or possible character of substances in the interior of the earth, possessing the smallest vestige of probability, can justify the supposition that the earth's upper crust has remained nearly as it is, while from the whole, or from any part, of the earth so great a quantity of heat has been lost."

EARTH ONCE RED-HOT.

By considering the cooling of the earth, and by tracing backwards the process of cooling, Lord Kelvin came to "a definite estimate of the greatest and least number of million years which can possibly have passed since the surface of the earth was everywhere red-hot." This estimate he expressed in the following words:

"We are very ignorant as to the effects of high temperatures in altering the conductivities and specific heats and melting temperatures of rocks, and as to their latent heat of fusion. We must, therefore, allow very wide limits in such an estimate as I have attempted to make; but I think we may, with much probability, say that the consolidation cannot have taken place less than twenty million years ago, or we should now have more underground heat than we actually have; nor more than 400 million years ago, or we should now have less underground heat than we actually have."

PROPHECIES OF SCIENCE CONCERNING THE EARTH AND SUN.

Researches by the leading scientists today, taken with the observations of others in the past, give indisputable proof that the earth is gradually cooling off, from the polar extremities toward the equator.

Eventually the earth will be like the moon, which has no water, no atmosphere. There are some indications of lichens, the lowest form of vegetable life, but that is all. The atmosphere of the moon is down to absolute zero—400 degrees Fahrenheit, minus. Everything is dead and frozen there.

The cause of the cooling off of both the moon and the earth unquestionably is the diminution of the heat of the sun.

To be sure, great heat does exist in the centre of the earth. We know this from the temperature of deep mines and boring into the crust in numerous parts of this country and Europe. But the heat of the interior of the earth would not, alone, be sufficient to sustain human or animal life on the surface.

Without the sun's heat we should all be dead within three or four days.

Not only is the earth cooling off, but the whole solar system is cooling off as well. When the sun no longer gives off heat the entire system will be like the moon. For years the diameter of the sun has been contracting at the rate of fifty-six yards a year. That is proved by the spectrum.

But, no matter how much the sun cools, the earth will go on just the same—though frozen and in darkness—by reason of the law of attraction. The system will still be held in space.

There are many dark bodies now in

the system—they have no light, no heat, everything on them is dead, yet they hold their place in the firmament. The light of or heat of the sun has nothing to do with the rotation of the planets. They will go on forever.

It has been said by competent students of astronomy that the temperature of the sun has taken a sudden drop.

Professor Newcomb estimates the time when life will become extinct on the earth at from four to five millions of years, so there is no need for immediate worry.

However, suppose there should be a drop of, say, 10 per cent. in the temperature of the sun. One immediate effect would be that Labrador and Canada could not be inhabited. The people there would be obliged to move down into New England. The animals in trees left behind would be frozen to death. Only the lower forms of vegetable life could exist there.

As the heat of the sun diminishes so the inhabitable zone will grow smaller, north and south, until at last only a little band will exist around the earth at the tropics. This band, too, will in time fade away.

As the earth grows colder and colder the inhabitants will doubtless become smaller. The small stature of the Esquimaux is due to the rigor of the land in which they live. The inhabitants of what are now the tropics will one day be like the Esquimaux.

END OF THE WORLD PROPHECIES.

One of the earliest recorded failures to bring all creation to an ending crash was that of the old Bishop of Hippo. When his scheme of annihilation did not connect in 395 A. D., the bishop went over his figures once more and declared that he had been a century out of the way. This restored his standing as a prophet and made it sure that he, at least, would not live for a second disappointment. His courage in readjusting dates has come down the ages without his discretion in setting the end far enough ahead to dodge the issue.

In the year 1000 all Christendom went into terror and many persons died of fright because that year had been set as "the time appointed" by a Scripture-crazed seer. In 1212 great populations crowded the Italian shores of the Mediterranean waiting for the sea to dry up, as had been promised by some crank, so that they might walk to Jerusalem for the general perishing. In 1335 an Italian priest scared half of Europe out of its wits by issuing a general warning to put on the last bridal robes. And so the direful foretellings went on until there came the plunge of Steiffel in the sixteenth century.

Steiffel was a mathematician and a friend of Luther. For twenty years, or some such matter, congregations had listened to him, believing him to be "the seventh angel named in the Apocalypse." When he fixed upon Monday, Oct. 3, 1533, as the day, and 3 o'clock in the morning as the hour, for the earth to go out of business, he was able to set a great crowd of people to moaning and groaning. Previously, at his urging, these people had separated themselves from most of their worldly goods. As the hour passed and destruction came not, the

lamentations turned to denunciations. Herr Steiffel then got such a mobbing as has not yet come even to a fashionable wedding party in a New York church.

It would take a tremendous book to follow up the late prophets of the world's end. There are few decades which have not contained one or more dates for the catastrophe. The Adventists have learned caution. They wait now hopefully, ready for the finish at "any old time." Yet in July, 1889, Mr. Henry A. Chittenden, a former New York dry goods merchant, one of the believers of '43-'44, sent out bulletins of belief that the very year was then upon us.

An Indiana farmer-prophet says the year 2000 is to be that of fate. The Rev. A. B. Simpson, noted for his ability to lift church debts, favors 1934 A. D. Other choice dates are 1915 and 1941. The prophets have a large variety of calculations on hand, and their motto is, "We try to please."

As a rule, predictions of a final catastrophe in matter are based on individual readings of the Scriptures. Real scientists flirt occasionally—and usually by request—with the possibilities of planetary collisions, consuming solar fires and exhaustion of atmosphere. M. Flammarion weaves awful contingencies into delightfully shivery romances. But there are always waiting groups of unfortunates ready to take everything seriously.

Pending other arrangements for their personal comfort in the premises, all who have an uncertain faith in the stability of the earth are urged to consider the view presented not long ago to the American Association for the Advancement of Science. This gives three billions of years before the end. So may we all have time to eat, drink and be merry and yet preserve a proper diligence.

IS THE SUN INHABITED?

There have been many and various hypotheses brought forward as to the possibility of some of the planets being habitable to human beings similar to those peopling this earth. But a still more startling and ingenious theory has lately been published by an American astronomer, Mr. Young, who asserts that the sun itself may be a land like our own. The idea is that the solid globe is surrounded by an atmosphere which is a non-conductor of electricity and heat. The sun, according to this imaginative theorist, is a centre of electric force. Converging streams of electricity are ever flowing to this centre, but on meeting with the non-conducting atmosphere become changed into a brilliant discharge, which gives the appearance of a solid incandescent body. Away in the centre of this brilliant crust, and far separated from it by the non-conducting atmosphere, lies a beautiful planet having all the most desirable characteristics of our own earth. But it is only very rarely that we can obtain a glimpse of this abode of bliss or its strange inhabitants, if they exist. Then it is through the aperture or rift in the luminous clouds which we call a sun-spot.

DISCOVERY OF THE MOST ANCIENT RUINS.

The discovery of a lost city of antiquity in the land where tradition has located the Garden of Eden in the plain between the Tigris and Euphrates rivers is the first great achievement of the Chicago University exploring expedition in Babylonia.

The ruins that have been unearthed by Prof. E. J. Banks and his one hundred and twenty native workmen are identified by him as the remains of the city of Adab, possibly the oldest city in the world, certainly one of the group of the oldest cities of which there is any knowledge or tradition. Prof. Banks began work on the mounds at Bismya early in 1904.

A little of the chronology of the Babylonian dynasties is suggested when it has been found that the earliest recorded inscription in Babylonia, as yet discovered dates back 4,500 years before Christ. King Sargon and his son, Naram-Sin, are supposed to have reigned in Babylonia about 3,750 years B. C., while Berosus, who wrote the story of the flood of the time of Noah, tells of ten kings and

Site of the oldest city of the world that has yet been unearthed.

Conference of Japanese priests and teachers of the old and new religions at Tokio. A thousand delegates declared that the war was one waged in the interests of justice, humanity, and peace.

eight dynasties before his time which had ruled in Babylonia more than 432,000 years!

As to the work of the present expedition of the University of Chicago, even the average reader of this ancient Babylonian history may be at sea on the subject of the city of Adab. The inscription "Ud-Nun-Ki" put upon the bricks under the ruins of Bismya seems to have given to the archæologists the idea that Adab has been uncovered. As late as 1900 A. D., however, Dr. Radau announced that "Ash-Nun-Na-Ki" was one of the unknown cities of Babylonia. He wrote of a certain collection:

"The old Babylonian tablets in this collection belong for the most part to the third millennial, B. C., and are dated in the years of various kings and patesis of Ur and Shirpurla, with one tablet from an unknown city of 'Ash-Nun-Na-Ki,' and one published before, bearing the name of a king of Larsa."

BRICKS PROBABLY MARK WORLD'S OLDEST CITY.

Presumably the "Ud-Nun-Ki" referred to in the Babylonian cable from the orient is the "Ash-Nun-Na-Ki" of the bricks marking ancient Adab. As to some of the other famous cities of Babylonia, the national epic of the Babylonians, grouping old myths around a solar hero, names only four: Babylon, Erech, Nippur, or Calneh, and Surripach or Larankha.

Of these cities the American archæologist has taken greatest interest in Nippur or Niffer, as it has been called. It was in this buried city several years ago that the University of Pennsylvania delved to the edification of the world. It was here that a great temple of Bel was uncovered and more than 90,000 documents taken from the great library. Here, as at Bismya, another more ancient city was unearthed by the expedition from the Keystone state university.

In these first excavations the University of Pennsylvania attempted first to discover the temple. This temple was accredited to the administrations of King Sargon and his son, King Naram-Sin. It consisted of eight square stages made of brick, the basement stage measuring more than 200 feet square. A winding pathway reached to the summit. Digging into the mound that marked the temple the searchers found that in the centuries following the building of the ancient city the drifting sands and debris of the ages had covered the Sargon city to a depth of thirty-three feet. But when the last stage of the temple of Bel was reached the archæologists went down another twenty-eight feet to discover the ruins of "another venerable sanctuary of Babylonian culture and civilization, founded centuries before the coming of Sargon and Naram-Sin." This expedition discovered that the temple originally had been dedicated to the god Mul-Lil and afterward dedicated by the Semites to the god Bel.

HAMPERED BY GOVERNMENT AND ARABS.

Delving into the ruins of these buried civilizations the archæologist has had his troubles with the Turkish government and with the marauding Arabs, who have been desecrators of these templed cities. More recently the Arabs have offended less in this way. The last expedition of

the University of Pennsylvania found the Affej Arabs living near the mounds of the buried Nippur to be peaceable and disposed to care for their herds of buffaloes, sheep, goats, and camels. As the inundations of the Euphrates river made tilling the ground possible, these tribesmen tilled the soil, living the half nomadic, half domiciliary life which the ancient records read into the life of Abraham when his people went out of Ur in flight from the conquering Elamites.

As to the inroads of the Arabs into these buried treasures, even a Christian has been led to say of them in apology: "It must be admitted that the ignorance and corruption of the Turkish government and its officials have offered a serious obstacle to the action of the museums and encouraged the illicit traffic in antiquities. But, on the other hand, the Turk may have decided that he has found archæologists, as a whole, fully as unreliable and tricky as himself, and that if he is corrupt they are the corrupters. In reality this rivalry and these jealousies of the museums have been the main reason why no steps have been taken to prevent the wholesale destruction of Babylonian ruins by the antiquity dealers."

BABYLONIA—THE CENTER OF CIVILIZATION.

This ancient Babylonia, where after 6,000 years or more remnants of its civilization are coming to the light, always has been of deep interest to the modern civilizations. The British museum has a tremendous store of Babylonian antiquities and various public and quasi-public institutions in America have taken their shares from the mounds that have buried these cities of ancient temples beyond all save the archæologist.

The historian has found much in the natural resources of Babylonia to have made it the center of Asiatic civilization. According to Herodotus, the soil was so rich as to return 200 and 300 fold to the sower. Wheat made two harvests for grain and afterward was considered good provender for sheep. Apples and other fruits, together with wheat and barley, grew wild over the country.

Beyond these resources of the husbandman, bricks lay almost ready to hand in the soil. Burned or simply dried, these bricks were everlasting, and when put into walls with the native pitch instead of lime they have been proved by the elements for almost countless ages.

ARCHITECTURAL KNOWLEDGE OF HIGH ORDER.

The peoples under which this civilization ripened are considered today to be the equals of the Hungarians and the Turks. The first monarchs, whose monuments may be read from today, had their seats in the city of Ur. One of the greatest buildings and one of the oldest was the temple of the moon god, built by a prince regarded as the first architect of the country. Bitumen was used instead of lime, but the buttresses, drains and ornamental portions of buildings indicate that architectural knowledge had been widely developed.

In the same era with this building in Babylonia the cuneiform system of writing had been fully developed. Signet stones were carved with a skill that makes wonderment for the twentieth century. In the temple of the sun god it is estimated

that 30,000,000 bricks were laid in the building of it.

As to the labor at the command of a Babylonian monarch, Nebuchadnezzar in one of his inscriptions, tells of having completed the Imgur-Bel in fifteen days. In Babylon the temple of Bel stood with eight square stages of brick, the base stage measuring more than 200 yards square. A winding road led to the summit, upon which stood a colossal figure of Bel, forty feet high and of pure gold. A table forty feet long was there and fifteen feet wide, with other images and altars placed along the sides of the temple, all of pure gold.

In building in the time of Naram-Sin, the walls of the later Nippur were constructed of the greatest bricks that ever have been uncovered in the Babylonian provinces. These bricks were all burned and stamped with the name of the monarch. Since the time of Naram-Sin no such bricks were turned out in Babylonia. Some of the outer walls of Nippur were laid with brick that were dried in the sun, but which have been proof against the inroads of time. In the laying of all these bricks a certain pitch that poured from subterranean streams was used. The substance has been described as rushing from the ground, hot, with a hissing noise. In other places the bitumen came up with almost cold water, from which it was easily separated and prepared by heating.

All about Adab are the relics of a most ancient civilization.

To the east lay the ruins of Shirpuria (now Tello) on the canal that 5,000 years ago connected the Tigris and the Euphrates. Here recent explorations brought to life a library of 30,000 inscribed tablets. To the southwest are Erech and Ellasar of Biblical fame, the latter the seat of the worship of the sun god.

DISCOVERY ADDS WHOLE CHAPTERS TO HISTORY.

The discovery of the city of Adab is an almost marvelous sequel to the finding of the code of King Khammurabi. It forms a new link in a chain of remarkable revelations of long hidden secrets of the past, its unfolding due to the activity and intelligence which have marked the work of exploration of recent years in Babylonia. It is a record of achievements in a sequence that suggests the fictions of fable more than the chronicles of historic fact.

M. de Morgan, a French explorer, late in the fall of 1901, began work at the site of ancient Susa, the capital of the kingdom of the Elamites. He was led to this place by inscriptions found in the ruins of Babylon, from which he learned that many of the most important monuments of the Babylonian kings had been carried off as trophies of war by the Elamite kings to their capital city. He soon discovered the stele of Naram-Sin, who was King of Nippur in 3800 B. C., and shortly afterward startled the world with the news that he had found the great tablet on which King Khammurabi had inscribed his code of laws.

Khammurabi (the King Amraphal of Genesis xiv. 1) reigned in 2400 B. C., nearly 1,800 years before the time when Daniel read the mysterious handwriting on the wall at King Belshazzar's feast in Nebuchadnezzar's palace at Babylon,

when Cyrus and his Persians captured the imperial city.

In the introduction to his code Khammurabi extols his own achievements as the first king who ruled at Babylon, though he was the sixth of the first dynasty of the monarchs of Babylonia. Among his titles to fame he declares he was "the King who lent life to Adab," from which it is understood that Adab was one of the towns looted and wrecked by the Elamites in their early raids, and that Khammurabi restored the ancient city.

The third link in this wonderfully connected chain of discoveries is Adab. That it should have lain hidden and forgotten for unknown centuries, and now be found within the brief period of two years after the discovery of the ancient monument that heralded it to the world as one of the great cities of antiquity, is itself sufficient to excite the deepest interest in its discovery.

From the inscriptions on the bricks of the buildings first uncovered Prof. Banks learned that the ruined city was named Udnunki. But, as was the case at Nippur, the city was built upon the ruins of another city, and that still upon another. Deep down in the soil beneath the ruins were other ruins centuries older than those above them, and from these Udnunki was identified also as the Adab that far antedated the days of Abraham. Adab was old when Babylon was in its infancy. It was, like Ur of the Chaldeans, a city of the fabled olden times, when Khammurabi began his reign in Babylon 2,400 years before the birth of Christ.

OLDEST STATUE IN THE WORLD.

The oldest known statue in the world, a fabulously valuable marble image of Daddu, founder of the first dynasty of Babylonian kings, has been unearthed in Adab, the most ancient of earth's cities, by the University of Chicago Babylonian excavation expedition. Experts in Assyriology and antiquities say the statue antedates by centuries the rarest works in the world's greatest museums, and place its value far above that of the best Greek masterpieces, worth many times their weight in gold. Professor Harper regards it as one of the most important scientific finds of the age, ranking with the discovery by his expedition of Adab, mentioned in the Code of Hammurabi. The statue may be brought to Chicago. Dr. Banks, the famous Assyriologist and Egyptologist, who is in charge of Dr. Harper's party of excavators, in informing the head of the expedition of the existence of the statute, says it was discovered by superstitious Arab workmen, who, noting a white projection in the bank of a trench, fled from the spot in terror. Dr. Banks later dug the statue from the ground with his hands, only to find the head missing. After three weeks the head was found in another part of the ditch. An inscription on the right arm of the statue was translated as follows:

TEMPLE ESHAR
KING DADDU,
KING OF UDNUNKI (Adab).

Information gathered later by Dr. Banks revealed the fact that King Daddu lived centuries before the City of Naram-

Sin, which flourished in 3750 B. C. He places its date at 4000 B. C. "The statue is 78 centimeters high and 81 centimeters around the bottom of the skirt," writes Dr. Banks. "The upper part of the body is entirely naked and the lower part is clothed in an embroidered skirt of six folds, held up by a band and fastened behind. The back and shoulders are gracefully formed. The arms at the elbows are free from the body, and the hands are clasped at the waist; the eyes and eyebrows are now hollows, in which ivory or precious stones were set. This is by far the most perfect and graceful statue yet found in Babylonia."

THE AGE OF MANKIND.

OLDER THAN THE RECORDS.

Civilized man occupied the earth at a much earlier period than most people imagine. So far as the question of time is concerned, it deserves notice that not merely geology, but almost every form of inquiry into the past throws further back the limits usually assigned.

Egypt, for instance, is continually furnishing fresh proofs of the antiquity of civilization. Prof. Petrie expounded at Owens College, Manchester, England, a few days ago the results of recent explorations at Abydos, in upper Egypt, from which it appears that the ruins at that one spot tell a continuous story that carries us back to 5000 B. C. Abydos was the first capital of Egypt and remained for 45 centuries the religious centre, the Canterbury of the land, and there the Egyptian exploration fund has unearthed the remains of "ten successive temples, one over the other." From the age of the first temple a group of about 200 objects has been found which throws surprising light on the civilization of the first dynasty. A part of a large glazed pottery vase of Mena, the first king of the first dynasty, about 4700 B. C., showed "that even then they were making glaze on a considerable scale and also inlaying it with a second color. The ivory carving was astonishingly fine, a figure of a king showing a subtlety and power of expression as good as any work of later ages."

At about 4000 B. C. an ivory statuette of Cheops, the builder of the great pyramids was found, the only known portrait of him. Making every possible allowance for the marvelous rapidity of art development, must not many thousands of years have rolled over between the pristine dwellers in the Nile valley and the men who carved ivory statuettes and manufactured glazed work inlaid with second colors? It is a long, long march from flint implements to the solemn temple ivory statuettes and human portraits.

THEORIES OF THE ORIGIN OF LIFE ON EARTH.

The bacillus of today that can withstand 130 degrees Celsius of cold may be capable of existence in the ever-frozen space of the universe even now—the "universe cold" that rules between the planets, between the solar systems and that lies between us and the moon, between us and Mars, and between the sun and its red double star. Such a bacillus gives point to the theory of Humboldt

High speed tourist autocar.

—that life never began on earth through birth on earth, but that it reached this planet through some agency that brought it out of the universe in the right moment when the cooling earth offered the proper conditions.

He suggested that such an agency might have been a meteoric stone, carrying the primeval germs of life in a fissure.

We need not fall back on the meteoric stone. We have it in the presence of bacilli that can bear 100 degrees Celsius and more of cold.

We might ask if the earth in its daring flight around the sun does not at times cut through cosmic swarms of bacilli as it cuts through meteoric swarms? If the astronomers of the middle ages, who used to hold that all great comets brought pestilences to the earth, had been in possession of our present knowledge of bacilli, they might well have been led to imagine that the comet's tail carried the bacilli of the pest and rained them down on the unlucky earth.

These are dreams. Yet it is undeniable that there is something weird about the properties of bacilli, something that points at one and the same time to the oldest existence on earth and to the last living thing—man.

When man appeared first on the earth in times primeval he was literally submerged in representatives of the realm of the singled-celled creatures. Every breath, every drop of water was filled with them. As a few scattered peaks stick out of abysmal seas, so the few sparse types of true plants and animals appeared in the mist of unicells.

From the beginning the mass of these unicells met man not as enemies, but as friends—that is, they did their work without considering man, but in a direction that served him. When he became an agriculturist this benefit increased immeasurably, for the bacteria loosened his earth, helped his plants and ruled mysteriously while he plowed and dug.

Now, in gray time primeval, long, long before man or the thing that was to become man, "life" must have appeared for the first time; in the Cambrian epoch, in whose deepest layers we perceive the first fossil remains of the earth's story.

All theories unite on the one that the oldest living things of that time were unicells. Whether or not they were unicells like our present bacteria is of comparatively little importance. The main thing is that they were single-celled things.

THE TRIUMPH OF THE CELL.

And it is established, too, how the gathering of certain unicells into a group first produced the living thing with separate functions—the cell community.

The cell community was the first great progress, the first great development in the measureless space of time.

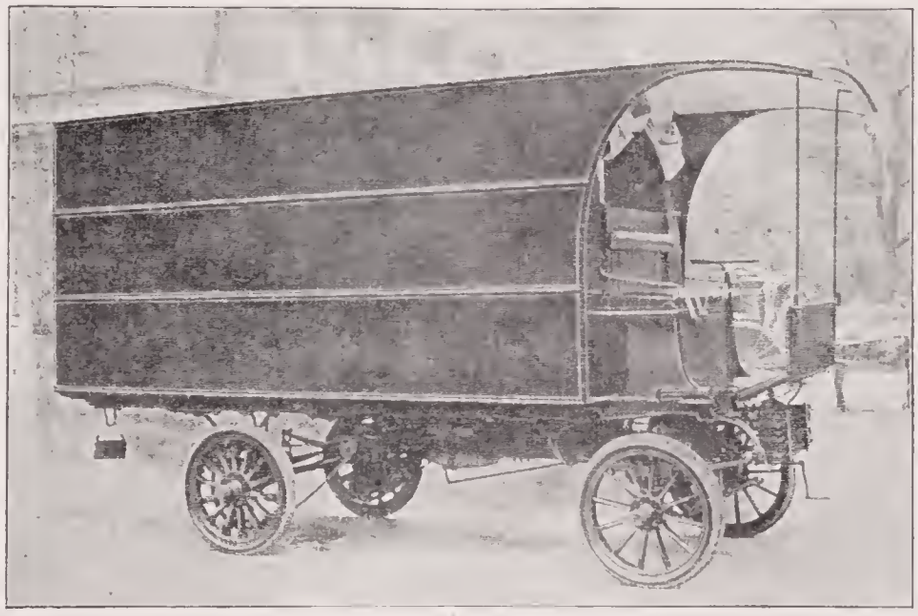
And through many strange fortunes, by many wild and mysterious ways, passing through countless shapes, fearful, horrible and weird, man, the height of development, emerged from that dim, forgotten first gathering of shapeless clumps—man, with the centralizing brain that the cell-creature plant does not possess at all, that the cell-creature beast has in only faulty development.

And yet this human brain is nothing other than a cell-community in the cell-community man.

MEASURING THE EARTH.

NECESSARY DELICATE SCIENTIFIC OPERATIONS.

The science of geodesy is making rapid strides along the line of accuracy, and there is not much left to be perfected in the way of method. The all-important problem of modern, as well as ancient goedesy, of course, is the measurement of the dimensions of the earth, which enters into all practical work of surveying, navigation and terrestrial physics. The International Geodetic Association several years ago undertook the problem, the different nations having agreed to contribute their share towards an accurate determination. The determination was undertaken in Ecuador, in 1901, and extended from the Colombian to the Peruvian frontier, and every possible refinement to attain the maximum degree of accuracy was adopted. The greatest difficulty is to secure an accurate base line, which is complicated by so apparently trivial a thing as the expansion of the measuring medium. The latest refinement in the bar method is that originated by the United States Coast and Geodetic Survey, using a single bar immersed in melting ice, the containing trough being carried on a suitable car upon a temporary track. Later still, M. Guillaume discovered an alloy of 64 per cent steel and 36 per cent nickel possesses an exceedingly low coefficient of expansion, and, consequently, offers the best medium for accurate base line measurements. This alloy is known as "invar," and is usually employed in the form of a wire supported by tripods and stretched by a definite weight. A very valuable piece of work on the Island of Spitzbergen was completed with the use of this alloyed wire.



A two-ton commercial automobile van.

Even the infinitesimal variation in the force of gravity at different portions of the earth is not too insignificant to be disregarded and must be determined and a correction applied. This delicate de-

termination is made by observing the pressure of the atmosphere by the determination of the boiling point of water, and comparing the same with the barometric reading, the difference, if any, being considered due to a variation in the action of the force of gravity upon the mercury.

A HOLE IN THE EARTH.

Prof. Parsons estimates that to sink a shaft twelve miles deep would cost $25,000,000, and that it would require eighty-five years to accomplish it. This shaft, cut down into the earth, would represent the equivalent of a hole one foot deep in a mass 666 feet thick. It would solve many questions that the scientific knowledge of the world has left unanswered, yet it would investigate only the crust and leave thousands of miles of the interior mass still untouched.

No man has gone down into the earth's interior beyond the distance of one mile and lived to tell the story. The deepest boring in the "crust" of the planet is 5,000 feet—less than one four-thousandths of the distance to the centre of the globe.

The earth's interior is a vast unknown, beside which, in the realm of mystery the heavens are an open book. The most daring explorer seeking new fields of heroism in unraveling the mysteries of nature has halted even before he could plan to surmount the obstacles that lie in the pathway of the secrets of the earth's mass.

TO TEST FORCE OF GRAVITY.

The amount of compression at the globe's center should, to some extent at least, define the character of the mass of which it is formed.

Within the Washington monument, which is 550 feet high, is to be stretched a wire 500 feet long, on the free end of which will be hung heavy weights. Survey experts, who will conduct the experiments, hope by this means to gain a knowledge of the force of gravity at equal distance toward the centre of the earth.

It is argued that the great mass of the interior of the earth is solid. Against the contention that the planet, under a crust twenty-five miles thick, is a mass of fiery liquid is arrayed the fact of the known density of the globe. That density in the earth's entirety is about 5.5 times the density of the water that covers three-quarters of the surface.

SIR WILLIAM THOMPSON'S THEORY.

The assumption of a comparatively thin crust requires, according to Sir William Thompson, that this crust should have a rigidity possessed by no known substance. The sun exerts such a strain upon the substance of the earth that the planet could not maintain its shape as it does, he maintains, unless the supposed crust were at least 2,000 or 2,500 miles in thickness.

There is a gradual increase in the temperature while penetrating the surface of the crust. This increase in some localities is as rapid as one degree for each fifty-six feet of descent; in others one degree for seventy-five to eighty-five feet.

In the Comstock silver mines of Nevada, at a depth of 3,065 feet, water has a temperature of 170 degrees, Fahrenheit. The deepest excavations in the earth are at the Calumet and Hecla copper mines in Michigan, where the longest perpendicular shaft goes down 4,900 feet, while one of the standing shafts is more than 8,000 feet in length.

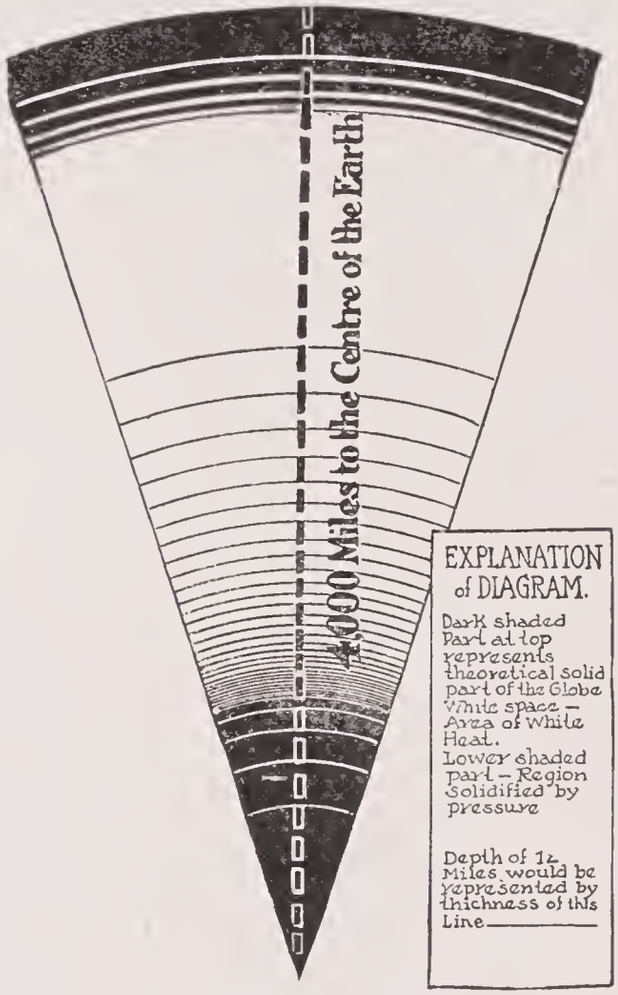
HEAT WOULD RENDER TOOLS USELESS.

There are in these mines 250 miles of lateral galleries. Colossal engines are required to ventilate the immense subterranean city and to keep the temperature endurable in the lower levels. All deep mine borings prove how stupendously difficult would be the task of descending below the mile level.

At the lowest rate of increase in the temperature in penetrating the earth, the heat at the depth suggested by Mr. Parsons, twelve miles down, would be 800 degrees, Fahrenheit. This heat, though far from the fusing point of wrought iron (3,280 degrees), would render the use of tools, even if the lower borings of the shaft were constructed as they are in oil wells, a difficult process. It would defy the most colossal scheme of artificial refrigeration to render such depths available for entrance by human beings.

No considerations of commercial benefit enter into the plans of Mr. Parsons in suggesting the twelve mile boring into the crust of the earth. It is a scheme purely in the interest of scientific knowledge.

DEEPEST BORINGS IN THE EARTH'S CRUST.



Scientific boring to discover the condition of the earth's crust.

Calumet and Hecla copper mine (Michigan)	4,900
Comstock silver mine (Nevada) with 300 miles of galleries	3,065
Viviers Reunis (Belgium) mine	3,489
South Wales iron mine	2,280
Oil wells, Western Pennsylvania	1,200
Louisville (Ky.) artesian well	2,086
Greuelle (France) well	1,797

DISTANCE OF ONE OF THE FIXED STARS.

Being asked to show a distinguished visitor in one of the great astronomical observatories one of the farthest stars, the astronomer fixed his great telescope on a star that looked no bigger than a pin point—a small, bright star, shining with a white and steady light.

"That little star," he said, "is so far away that it takes its light 3,500,000 years to reach us. The beam from it that you now see was given forth 3,500,000 years ago. What, I wonder, was the world like then?

"And do you know how fast these star beams travel? They travel at the rate of 12,000,000 miles a minute. Think of it—12,000,000 miles multiplied by 3,500,000 years reduced to minutes—that is the distance from the star to us.

"Here is a strange fact. The star may have been annihilated 2,500,000 years ago, but we, in that case, would know nothing of its annihilation till 1,000,000 years from now, for whatever should happen on this star would take 3,500,000 years to reach us.

IS MAN THE CENTRE OF THE UNIVERSE?

Dr. A. R. Wallace considered the greatest naturalist after Darwin, and a contemporaneous discoverer of evolution with him, believes that the earth was specially created with direct reference to the development of man. His theories published in a book are summarized as follows:

1. The stellar universe forms one connected whole of finite and determinable extent.

2. The solar system is situated in the plane of the Milky Way, and not far from its middle point. The earth is, therefore, nearly at the centre of the stellar universe.

3. The universe consists throughout of the same kinds of matter, and is subjected to the same physical and chemical laws.

So much he takes to be certain; while three further propositions have "enormous probabilities in their favor." These are:

4. No other planet in the solar system besides the earth is inhabited or habitable.

5. The probabilities are almost as great against any sun besides our own being attended by inhabited planets.

6. The nearly central position of our sun is probably permanent, and has been specially favorable, perhaps absolutely essential, to life-development on the earth.

The "great and definite" outcome of his reasoning is, then, "that man, the culmination of conscious organic life, has been developed here only in the whole vast material universe we see around us." Nor does he admit any incongruity in the idea that our race, "the unique and supreme product of this vast universe," was its final cause—the purpose for which it was designed. Man is the superlative of nature.

A noted reviewer of this book says: "Unquestionably the trend of modern re-

Example of heavy automobile truck wagons.

search is to encourage the opinion that the solar system is set apart among the stars and the earth among the planets, as if for the express purpose of harboring in safety the frail craft bearing the burthen of life."

JAVA MAY HAVE THE MISSING LINK.

SPECIES OF MONKEY FOUND WHOSE HABITS CLOSELY RESEMBLE THOSE OF MEN.

A French scientific journal announces that a new animal, much resembling a monkey, but much nearer in habits and culture to man, has been discovered in Java.

A merchant named Van Beuren happened to get lost in a forest and was obliged to spend the night under a tree, on which he discovered a giant nest with a circular opening measuring eighteen inches in diameter. This nest was occupied by a family of animals much resembling the ordinary monkeys, with the difference that their heads were covered with long brown hair.

OBSERVE ANIMALS FOR MONTHS.

After his return to civilization M. Van Beuren told an American scientist, Dr. Werdehouse, of his discovery and they returned together to the spot, where they spent several months studying the habits of the animals.

Contrary to the custom of monkeys, these animals, which the natives call "asch perrizlz," are very fond of bathing, and the females usually adorn their necks with collars made of fruit kernels.

MOTHERS SING TO THEIR YOUNG.

They take good care of their little ones, but seem to be little prolific and near extinction. The mothers rock their little ones, singing like human beings in an articulate language of very few words. They eat fruits, birds' eggs and fishes and like to be near a fire, although unable to light one.

Dr. Werdehouse, who classified these animals as pithecanthropes, has been unable to capture any of them and had not the heart to kill one even in the interest of science. A scientific expedition has been formed to explore the island and capture one of the animals if possible.

THE UNSOLVED MYSTERY OF ENERGY.

We have heard many views expressed with regard to the emanations from radium, and to the other curious N-rays which are believed to be emitted from living bodies, and from inanimate objects as well. So far, indeed, from the interest in investigations into the ultimate constitution of matter declining, the world at large appears to look with eagerness for each new revelation of science which may bring us nearer to "the causes of things."

One of the greatest and widest of generalizations is that included under the term of the conservation of energy. An allied law, so to speak, is that known as the correlation of forces. They teach us that each manifestation of force or energy is accompanied by a corresponding loss on the part of the object or body which acts or operates, and they also in-

clude the view that all kinds of energy are probably only modifications of one form thereof, so that, as is well known, one display of force can be converted into an equivalent of another form of energy.

Out of friction we can get heat, and out of heat we can get light. If the electrical machine is set in motion by the energy locked up in the coal which feeds the steam engine that drives it, the resulting electric light can be thus referred back to the forces of the sun liberated aeons ago in the earth's history and through whose influence the old plants of the coal period ripened and grew. What we learn thus is a new reading of the adage, "From nothing comes nothing." To get power we must pay for it in expanding energy of one kind or another.

Now, radium was believed to present an exception to this universal law which operates as truly in the case of a man's muscles as in the case of the coal-fed engine. Food is his fuel, which renders him capable of performing the work his brain or his hands find to do.

If radium appeared to give forth emanations and to disperse force without apparent exhaustion and without calling upon some outward source for a fresh supply of energy, it assuredly stood unique as a terrestrial phenomenon. This is precisely where the mystery of radium intervened. Yet there are not wanting signs by way of showing that all our philosophers are not content to assume the existence of an exception to a universal law.

The case of radium and its emanations presents an instance which, on the theory of the conservation of energy, presents so striking an exception that the philosophic mind prefers to fall back on the view that this substance utilizes some form of energy from without than to assume that it represents in itself a store of never-failing kind.

If radium does wear out in time, that fact would settle the whole question. For then we should have merely to fall back on the theory that in place of making force out of nothing, or even of utilizing some outside source of supply, it represents a form of matter which can store up acquired energy in a very remarkable fashion.

We know the matter which lives, but we are ignorant of the conditions under which it acquires its vitality. It feeds, grows, and multiplies, but these vital events are the result and not the cause of its living. Even when we descend to life's groundlings, we may feel as powerless to explain the nature of the vitality which animates a blob of simple protoplasm as our science is inadequate to determine the cause of the life actions of man.

The two fields of inquiry, physical and vital, may touch at certain points, but the living domain is separated as regards its causation from the purely non-living area of a Rubicon which at present no thought can cross. "What is life?" is a question all the ages have asked, and it remains still unanswered. Radium, with all its mystery, is a simple thing compared with the innate nature of the animalcule in the water-drop.

LUMINIFEROUS ETHER.

Certain facts connected with the propagation of light go far to establish the belief in the existence of a mysterious, colorless, odorless, invisible, and inconceivably rarefied substance called the luminiferous ether which fills all space, even the interstices between the molecules of the most dense bodies, for the molecules of any body, however dense it may be, are not in absolute contact, but separated from one another by an infinitesimally small space which allows slight motion among the molecules. Sound and light are similar as regards their mode of production and propagation; the former by waves of undulations of the air which impinge on the drum of the ear and thence transmitted by the aural mechanism through the auditory nerve to that portion of the brain which takes cognizance of this kind of motion; the latter also by waves or undulations in the ether similar to those which produce sound, but in the case of light, the magnitude of the waves is infinitely less and the velocity infinitely greater.

In the electric storm the waves of ether convey to our eyes the lightning flash, while the waves of air bring us the sound of the thunder. If the ether did not exist light could not be propagated from a luminous body, and the universe would be in profound darkness, for it is not conceivable that waves of light could be transmitted through an absolutely empty space. This mysterious body holds the vast universe in one compact mass. It is the medium of the most powerful and terrible of elementary forces.

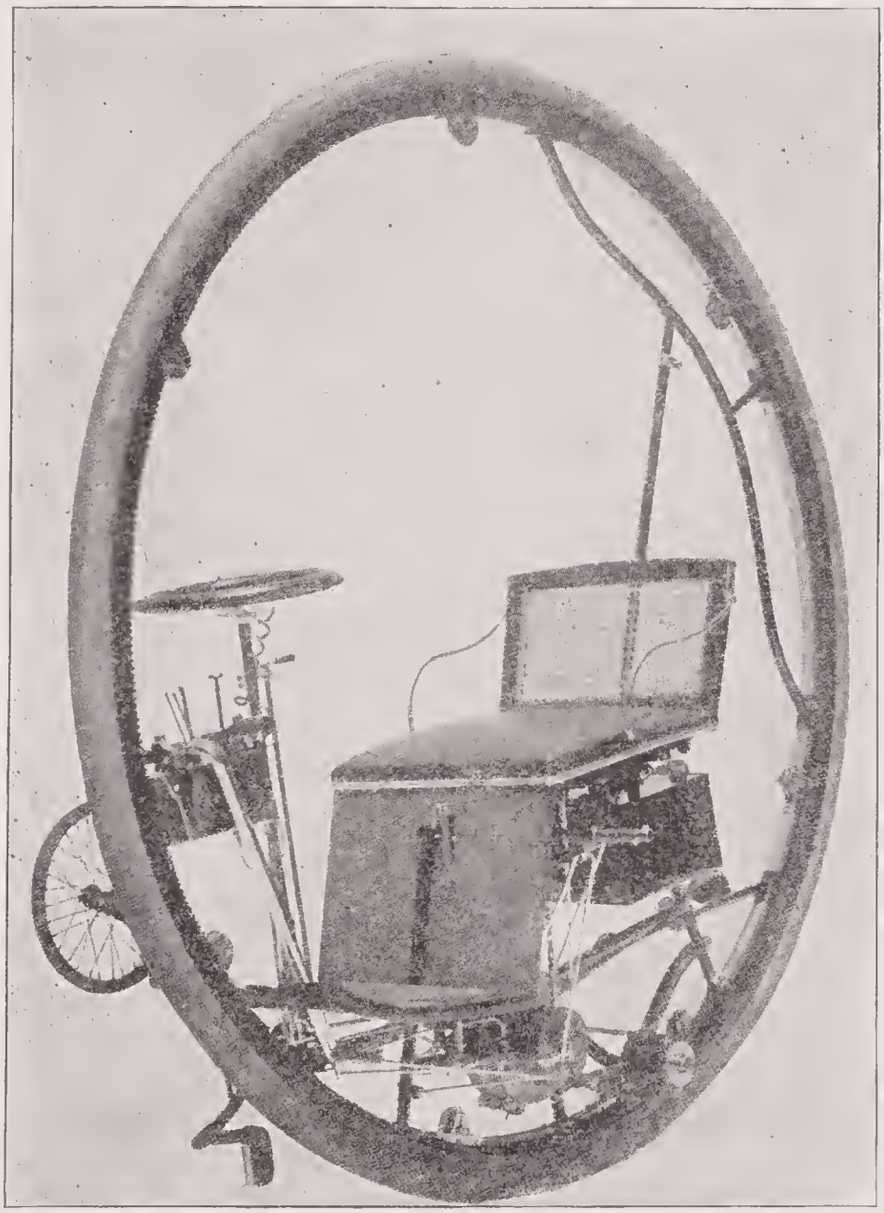
It cannot be destroyed, exhausted, or changed in any respect. We can no more exhaust the ether from a given space than we can create a world. The length of the waves of ether determine the color of light. Thus, in the extreme *red* rays of the solar spectrum there are 37,640 in one inch, and 442,000,000,000,000 (four hundred and forty-two trillions) waves pass a given fixed point in one second of time, while in the extreme violet rays of the spectrum there are 59,750 waves to the inch, and seven hundred and two trillions pass in a second. The intermediate colors, orange, yellow, green, blue and indigo, have values between these extremes. They all move with the same absolute velocity, viz., at the rate of 186,330 miles per second, but with different wave lengths. There are, however, waves beyond the extreme red, whose length is too long for our eye to take cognizance of them. These are the heat rays, and appear dark for the reason just given. So also there are waves beyond the extreme violet which are invisible because their wave length is too short. These constitute the chemical waves, which are mainly employed in photography.

The existence of the ether has enabled astronomers to solve one of the most astounding problems ever undertaken by man, viz., the determination of the actual motion of the so-called fixed stars in the line of sight—that is to say, their motion either toward or from us. This is one of the grandest astronomical achievements of the nineteenth century.

Wireless telegraphy would be an impossibility were it not for the existence

of ether. The waves or undulations produced in the ether by electrical impulse may not only travel around the world but through it and also may be propagated to the planets and stars. If there are inhabitants on Mars, for instance, it would be quite possible to communicate with them or at least to exchange signals, provided they have a knowledge of the existence and properties of the ether and have the proper instruments for receiving the signals.

It is not possible to predict what may be accomplished in this line of research when we become better acquainted with the properties of the luminiferous ether. It no doubt plays an important part in the production of electricity which is even now not well understood. As ozone is a condensation of oxygen, so likewise electricity may be a condensation of the ether by some means which has hitherto eluded human research.



Freak in locomotion: A unicycle driven by a gasoline motor.

ARE METALS ALIVE?

So wonderful are recent discoveries in chemistry and physics that it will not be surprising if one day it be found that what we call dead matter is really alive.

Professor Vasu, experimenting at the Faraday Laboratory, in London, has gone far towards proving that tin, platinum, and other metals, are quite as much alive, though in a different way, as human muscles.

One of the stock experiments shown to every medical student is one which proves that muscle contracts when it is pinched, or electrified, or excited in any other way. A little piece of muscle is cut from a recently dead frog. One extremity is attached to a fixed point, and the other to the end of a pivoted lever. At the free end of the lever is a writing apparatus, which rests against a moving piece of paper.

MUSCLE AND METAL.

When the muscle is pinched it contracts, and moves the lever, so that an upward line is marked on the paper. Then, as the muscle lengthens again, a downward line is drawn. This happens each time that the muscle is stimulated, and the result is a diagram of wavy lines upon the paper.

The muscle, it may be said, remains alive for a considerable time after the animal has died—very much longer in the case of a frog than of a warm-blooded animal. So long as it is alive it can contract; so soon as it dies it ceases to contract. This is the reason why the electrical test is such an infallible test of death, and prevents any danger of people being buried alive.

Of course, tin and platinum cannot be made to contract by pinching. Therefore, Mr. Vasu uses a slightly different experiment.

If the ends of the piece of muscle be connected with a galvanometer, which is somewhat like a mariner's compass, it is found that when the muscle is pinched, or tapped, or twisted, it produces an electric current. Both ends produce equal currents, and so the needle of the galvanometer is not moved. But if one end be injured by nitric acid or by burning, it produces no electricity. The other end will, therefore, have things all its own way, and the electric current which it sends forth when pinched moves the needle.

TIRED PLATINUM.

Vegetable substances—the stalk of a leaf, for instance—act in exactly the same way.

But the surprising thing is that a piece of tin wire will give the selfsame results.

If that were all, we would not have much reason for surmising that metals may be living things. But Mr. Vasu has performed a long series of curious experiments.

Muscle, as we all know, grows tired from use. Just as the muscles of the arm will refuse to lift a dumb-bell after a certain number of times, so will the little experimental strip of muscle refuse to give electric currents. After the first few stimuli, it will move the needle of the galvanometer less and less, until it ceases to move it altogether. But the very same thing happens with a strip of

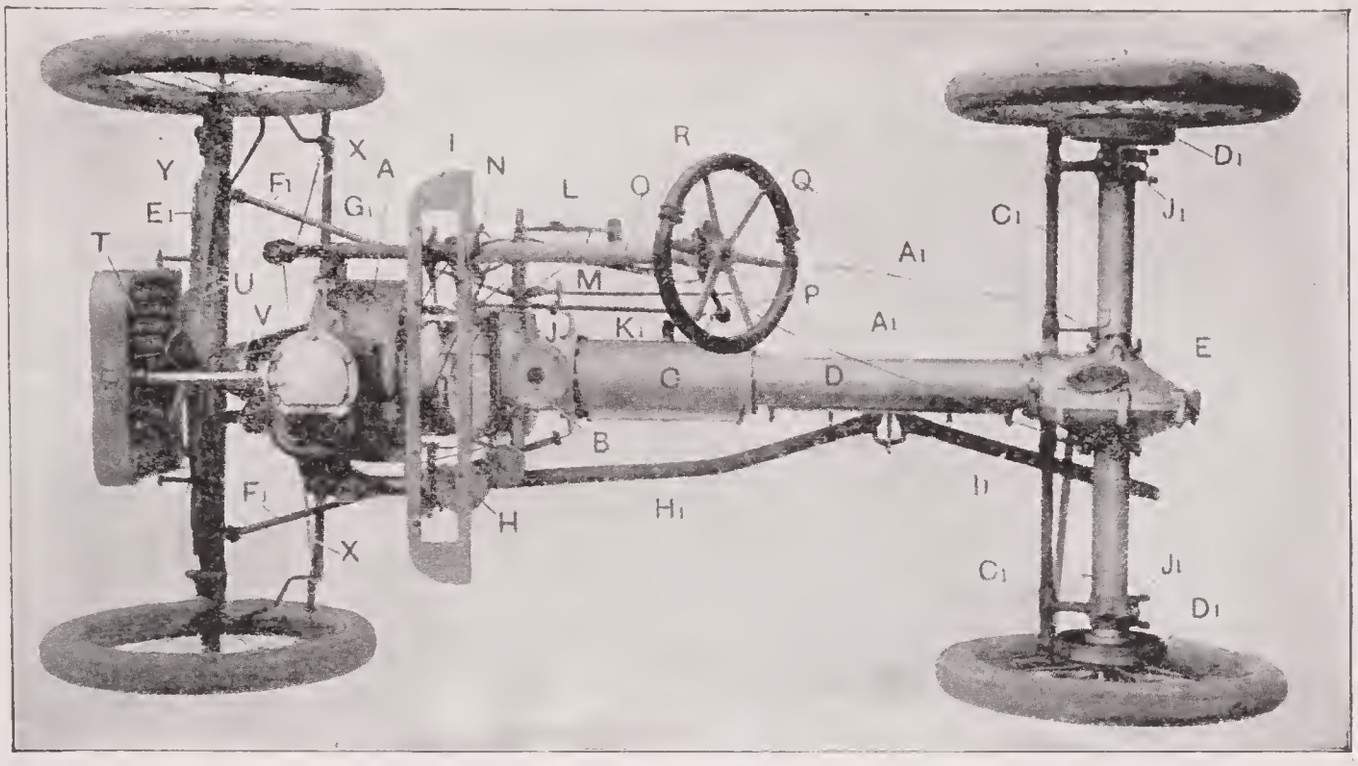


Fig. No. 1. Mechanical construction of eight-horsepower automobile.

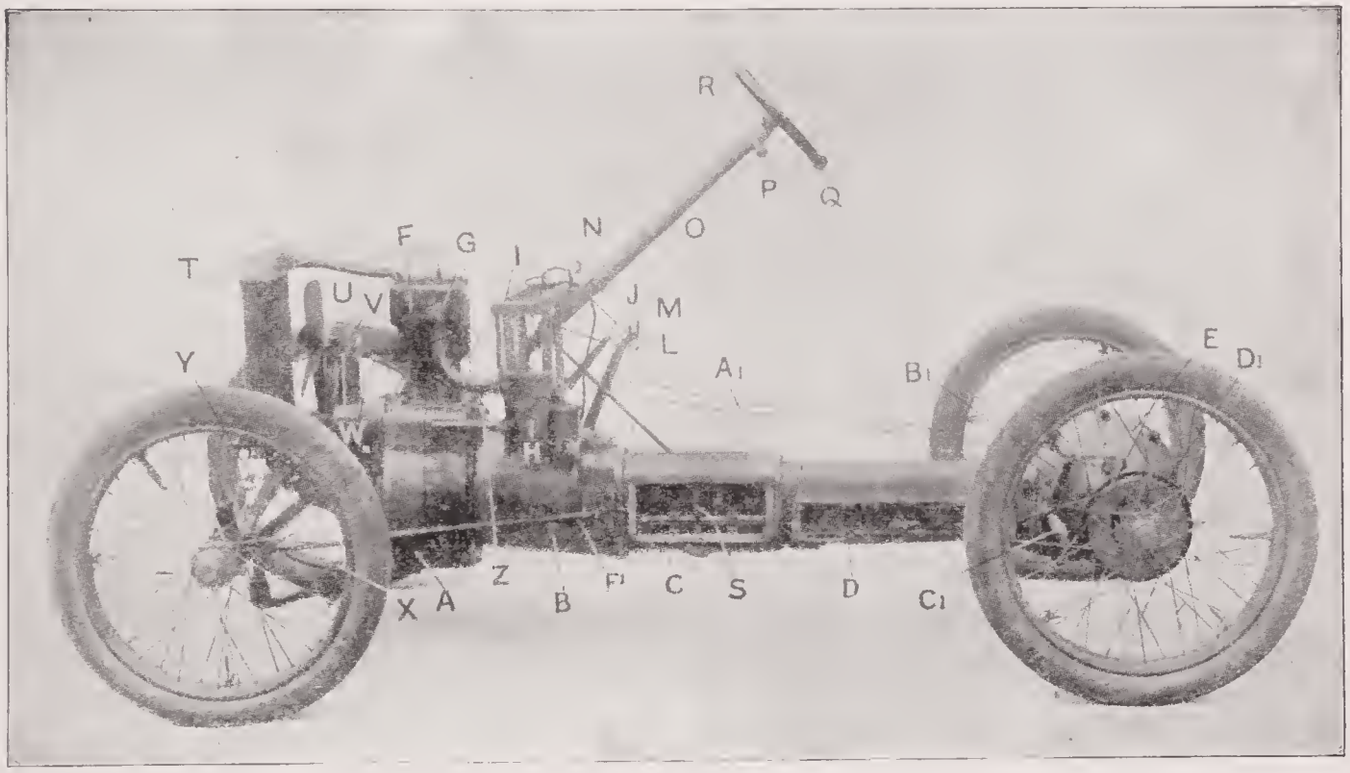


Figure No. 2. Same machine in upright position.

A, engine crankcase
A1 A1, steel cables for foot brake
B, clutch case with inspection lid
B1, rear brake levers
C, gear case with inspection hole
C1 C1, rear brakeshafts
D, propeller-shaft case (upper part), exhaust box (lower part)
D1 D1, rear brake bands
E, bevel gear case and rear axle case in two half castings
E1, swivel bar for front part of body
F, exhaust port of cylinder
F1 F1, compression rods for front axle
G, inlet connection of cylinder
G1, cross connecting rod for steering levers
H, carburetter of Rover automatic type
H1, exhaust pipe from engine to forward part of exhaust box
I, aluminium bracket to make up dash and support various parts
I1, exhaust pipe from rear part of exhaust box to the atmosphere
J, foot lever to operate the cams on the engine half-time shaft
J1 J1, brackets to carry the rear body springs and brake bracket
K1, connecting rod to striker S (from shaft F1, fig. 5) from lower lever operated by P
L, foot lever for rear brakes D1D1
M, foot lever for clutch
N, quadrant for change speed gear
O, steering stem
P, gear changing lever
Q, R, throttle and ignition control discs operating Bowden wire mechanism
T, radiator
U, high speed fan
V, fan belt
W, pump case
X X1, wire steering connections
Y, cross spring for front part of chassis
Z, contact maker

platinum—that is to say, platinum suffers from fatigue just like muscle.

But if in lifting the dumb-bell a good rest is taken between each two efforts, then one's arm does not grow tired. So with the little strand of muscle. If the pinches are given at considerable intervals, it will continue moving the needle equal distances. And so also with the strip of platinum.

Nerve, on the other hand, never gets tired like muscle, and there are metals which resemble nerve in this respect. Tin was believed to be indefatigable. But Professor Vasu found that when he kept it going for several days it gave in at length.

Strange as it is to find metals subject to fatigue, it is still more strange to find that they are influenced by chemicals very much like ourselves. They can be stimulated, depressed, and even poisoned.

WIRE WHICH WRITES.

In experimenting with the strip of nerve or muscle or leaf-stalk, if some chloroform be applied to it it will cease to give an electric current, but after a time it will recover; if the poison veratrine be applied the muscle will recover, but not for a very long time; if nitric or sulphuric acid be applied it will never recover.

Compare these facts with what occurs in a piece of tin or platinum wire.

First, the piece of wire is placed in pure water, and is then excited by a tap or two or a twist. It gives forth an electric current, and a line of a certain height is drawn by the writing apparatus.

Then a little bicarbonate of soda is dissolved in the water. This chemical has quite a stimulating effect on the tin wire, and so the electric current produced is stronger, and the line on the paper becomes longer.

Next a depressant is tried, and the same drug which depresses our own nervous system—bromide of potassium—also depresses tin. The consequence is that the electric current from the tin is reduced in power, just as in the case of our own nerves.

TONICS FOR TIN.

But even a more striking effect can be produced. That deadly poison, oxalic acid, which painfully kills so many foolish suicides, is also a deadly poison to the tin wire. If so small a quantity as one grain in ten thousand grains of water is used, the electrical response of the tin wire is destroyed. The wire may be washed with water and scraped with emery paper to remove the poison, but still it gives no response. It is just as dead as a poisoned human being.

This sensitiveness of metals to drugs is shown in a still more marvelous way. There are several drugs which, if taken by human beings in small doses, are stimulating, but if taken in large doses have the opposite effect. One grain of quinine two or three times a day, for instance, acts as a stimulant. But if doses of three grains and upwards were taken the effect would be seriously depressing. Now, a piece of tin wire is affected in precisely the same way by solution of potash. When three grains in a thousand of water are applied, the tin becomes more lively, and gives off a stronger current; when thirty grains in a thousand of water are used

the wire is utterly paralyzed, and gives off no electricity whatever.

DO THEY THINK?

In many other ways the tin wire has shown evidence of possessing something remarkably like vitality. For example, it was affected by heat and cold, just as animals and plants are affected. When it was cooled down to within 9 deg. of freezing point it became exceedingly sluggish; when warmed to 86 deg. by means of hot water it became very brisk, as most plants would under the same conditions; but when heated to 194 deg. it grew so feeble as to give off only a very slight current.

Tin wire and strips of platinum may not be able to talk or walk. But it is obvious that they have feelings of some sort.

DISEASES OF METALS.

Many metals show symptoms of poisoning, rendering them unfit for use. Thus steel can, by means of small quantities of hydrogen and under certain circumstances, be very seriously affected. Let us take two steel bars of the same material, both heated to a red heat, one surrounded by air, the other exposed to the influences of hydrogen or hydrogen gas, chilling both bars in water after heating; we shall find the bar heated in hydrogen to be brittle, whereas the other bar, heated in air, will turn out to be far superior. The hydrogen has in this instance acted like poison upon the heated steel, and very small quantities of such poisonous matter will suffice to produce very violent effects. The disease in question can be radically cured, it only being necessary to anneal the poisoned bar, repeating the process by heating exposed to air. The poisoned steel, by being allowed to lie for a long time, will, without any further expert treatment, show signs of improvement to a certain degree, the poison gradually leaving it. A better treatment still is boiling in water or oil, which process may be compared to using warm compresses in the case of human beings.

Similar symptoms of poisoning, caused by hydrogen or gases containing hydrogen (as gas for lighting purposes), are apparent in copper when exposed to red heat. Not every kind of copper is susceptible to this poisoning in equal degree. Copper perfectly free of cuprous oxide is entirely exempt from poisoning. Most of the various coppers of commerce, however, contain cuprous oxide, formed during the smelting process while exposed to atmospheric influences. In such coppers, containing cuprous oxide, hydrogen causes a terrible disease on the copper being heated red hot. The copper bursts asunder and is permeated by cracks,

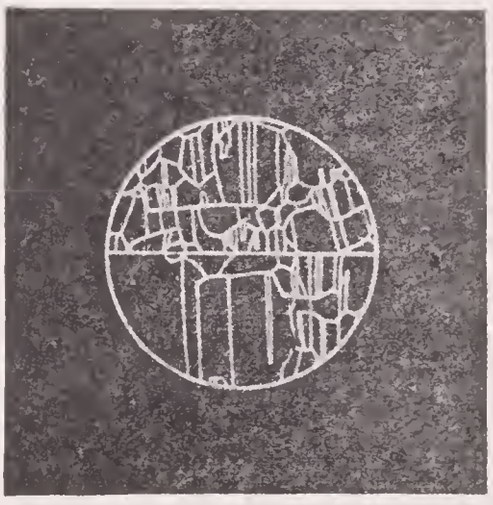


Fig. 1. Crystals in copper wire.

as shown in Fig. 2—natural size. This disease is practically incurable, and can be eradicated by re-smelting only. The results work destructively according to the amount of cuprous oxide contained in the copper.

METALS DISEASED FROM ABUSE.

Metals can become diseased from improper treatment, as, for instance, copper and steel when exposed a certain length of time to temperatures exceeding fixed limits. The copper in consequence loses a great part of its ductility and bending

Fig 2. Copper burst asunder by disease.

qualities. In steel the disease can become so virulent that a steel bar so infected can, on falling on the ground, break to pieces. The technical expert calls such disease "overheating."

Every tool manufacturer knows how easily common tool steel is apt to become diseased when, before hardening, it has been exposed to too high temperatures. In bad cases the disease will cause the steel to crack on being tempered. In light cases the cracks ensuing are not visible, but cause the edges of the steel to break off in use, besides giving rise to constant contention between consumer and producer of tool steel. Recent investigation has succeeded in fixing certain sure

Fig. 3. Structure of tool steel properly hardened.

characteristics to aid in determining the existence of this disease and to decide where to place the blame. Here the microscope affords us aid. The two

Fig. 4. Tool steel diseased by overheating.

microscopic photographs, Figs. 3 and 4, will serve to make this plain to the reader. Fig. 3 shows the structure of a piece of tool steel after passing through the proper hardening process. Fig. 4, on the other hand, gives an idea of the structure of

the same steel when, in consequence of overheating before tempering, it has become diseased. The illustrations are enlarged 750-fold. The difference between the two will be readily apparent.

Figs. 3 and 4 do not represent fractures, which, owing to the manner of the inequalities, would not admit of being so strongly magnified. The figures represent polished surfaces. A neatly smoothed cutting surface through the metal is polished and this polished surface treated by a proper etching reagent. The surface thus prepared is observed under the microscope, whereby the etched opaque polished specimen itself serves as an illuminating mirror. In this manner we can magnify 2000-fold. These processes, first employed by Sorby and A. Martens, today form the base for the proper investigation of diseases of metals and their various stages of life.

MYSTERIES OF THE LOWEST KNOWN FORMS OF LIFE.

The amœba is about the lowest form of life. It is but a mass of protoplasm, visible only under the microscope, a single celled organism, without arms, legs, mouth, or internal organs of any kind, reproducing itself by simple division into two parts, each becoming a separate animalcule. The home of the amœba is in ponds and ditches.

The habits and customs of the amœba should be of much human interest, as it is one of the starting points, perhaps the real starting point, in the evolution of man, and again because man is an amœbiform organism or a glomeration of amœbæ. From this point of view Dr. John H. Flagg, the scientist, had said much of interest to the Boston Scientific Society about the amœba as the "beginning of mind," for in this protoplasmic microscopic mass all the fundamental functions of mind may be observed. It has, as Dr. Flagg says, the usual animal functions of locomotion, sensation, selection, nutrition and reproduction, and for this reason he regards it as the beginning of psychic life. It moves without legs by thrusting out one series of pseudopodia in front and retracting others behind. Though without mouth or stomach, it eats by enveloping its food and absorbing it, rejecting everything that is non-nutritious. Though without a nervous system, it shrinks from a needle's point and from the source of light. It calculates position and distance. It "discharges a shower of darts at its prey while it is still at a distance, and, having disabled it, approaches and consumes it at its leisure." "They retire from their hunting ground to the shelter of a grain of sand, it may be, while they eat, but they have no apparent difficulty in making a straight line back in quest of more food, although the original route of exploration may have been exceedingly devious."

In a word, in this tiny, invisible microcosm Dr. Flagg finds memory, reason, cunning, intelligence, "a concentrated essence of life." As each of us, from highest to lowest, was in the beginning an amœba, though not an amœba of the ditch or pond hole, and as all, even the

best of us, are but an aggregation of amœbæ, it is but meet that we should be interested in this remote ancestor and proud of its general ability, though it may not be of the most strenuous sort. It should be remembered that the amœba is too little to be seen with the naked eye, and yet, while it has no physical organs and no gray matter, and an extremely limited environment, it is displaying physical and mental vigor of no common order. We have no reason to be ashamed of our protean animalcule, the amœba.

NERVE-LIFE IN PLANTS.

That certain plants exhibit sensitiveness to stimulation is a well-known fact. We have the case of the English sundews, whose leaves are provided with sensitive tentacles or feelers. When an unwary fly stumbles across the leaf its legs become entangled in the gummy secretion of the tentacles, and these last bend downward over the insect, and thus tie it to the leaf surface. Escape is impossible; the insect dies, and the leaf converts itself into a digestive hollow, within which the insect is digested by means of secretions nearly akin to those which are represented in the animal's digestive work. The resultant, in the shape of animal matter, is absorbed by the plant as part and parcel of its nourishment. Without insect food these plants cannot flourish. It is the general rule of nature that the animal feeds on the plant. Here the ordinary order of things is reversed; for the plant, as if in retaliation, demands the sacrifice of the animal to its nutritive needs.

Other plants exhibit a high degree of sensitiveness intended to assist the capture of insect prey. The "Venus fly trap," or dionœa, of North Carolina is an example in point. Its leaf is divided by a hinge into two lobes, or halves. Each half is provided with three sensitive hairs. If an insect touches a hair the leaf halves close upon it after the manner of the old fashioned rat trap, only the insect is inclosed within the leaf and is there duly digested.

There are other plants which, while they do not capture insects, nevertheless show sensitiveness in a high degree. Shelley's "Sensitive Plant"—the mimosa of the botanist—illustrates this latter type. The leaves droop on the slightest touch; yet if rain falls on them they do not show irritability. This fact would appear to indicate that the influence of "use and want" has been duly represented in such a case. If on the fall of every rain shower the plant carried out its leaf movements the result would imply a woeful waste of its nervous energy. Hence to natural stimuli, as it were, it pays no heed; but when, on the other hand, there is represented the touch of a foreign body, down goes the leaf.

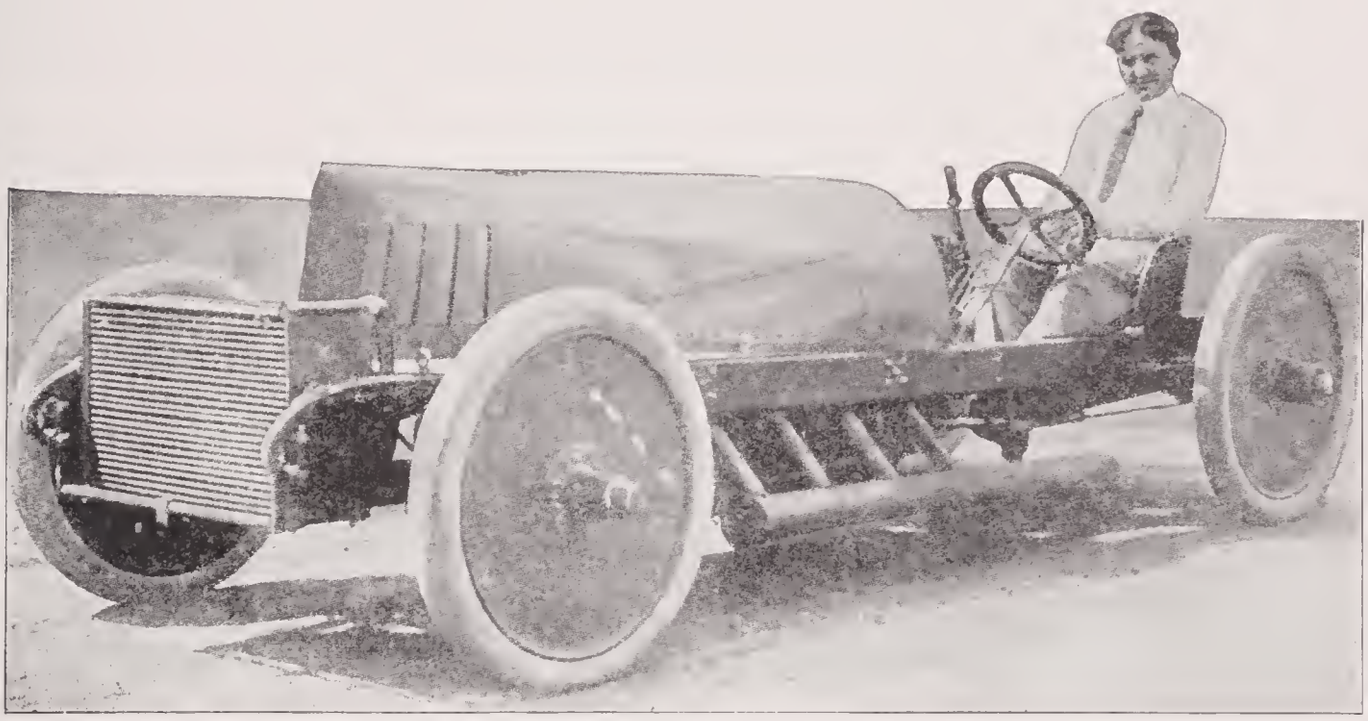
EXPLANATION OF SENSITIVENESS.

To explain these curious facts regarding the sensitiveness of plants we have to take a broad and general view of vegetable existence at large. It is a matter of common observation that ordinary plants show a certain degree of sensitiveness to heat and to cold. The daisies on the lawn will close their petals (or rather "florets") when a cold wave comes and open them again when the sun shines, thus illustrating a sensitiveness to the ele-

ments. All higher exhibitions of plant sensation are really developments of what we find to be universal in the plant world.

We may with safety assume that no living being, animal or plant, is nonsensitive. They must one and all possess a faculty of sensation, for the plain reason that one and all possess living matter (or protoplasm), and everywhere we meet with living matter we find it exhibiting sensitiveness as one of its primary qualities. The trend of our thoughts, therefore, clearly leads us to see that all plants are really sensitive, high and low alike; only certain species have acquired a power of exhibiting their irritability by way of capturing insects, or as in the case of the sensitive plants, for reasons we are unable adequately to explain.

When we have regard to plant structure, by way of endeavoring to explain the machinery on which the actions we have just described depend, we find that in plants the living matter is largely locked up within cells or minute sacs, with thick or at least resistant walls. It is different in the case of the animal. There we find the sensitive matter continuous throughout its frame. A nerve illustrates this latter fact, showing us the means whereby an impression made on one part of the body is readily transferred to another and distant part. The living matter of the animal, so to speak, is all in one; in the plant it is contained within separate cavities or cells, rendering obvious response to impressions less likely.



Barney Oldfield and his "Peerless Green Dragon," wrecked in race at St. Louis Exposition, when he was seriously injured and two bystanders were instantly killed.

Yet botanists have shown that from

cell to cell of the plant pass delicate connecting threads of living matter, and it is these threads which no doubt convey what messages plants can receive and act upon. In the case of plants which are markedly sensitive we may suppose there has been developed a greater facility for the conveyance of messages than exists in the case of their neighbors.

THE BEGINNING OF NERVES.

Is this, then, the beginning of nerves? We have only to suppose that in the animal body, owing to its special construction, there is freer scope for the play of nervous action than exists in the plant to explain why sensitiveness is more apparently a quality and feature of the animal than it is of its living neighbor.

DARWIN'S THEORY OF EVOLUTION.

Darwin's theory of the origin and development of the species has been so universally accepted that any opposing views from scientific sources is a novelty. Prof. Hugo de Vries, a famous Dutch scientist, disagrees with Darwin on one important point. Darwin believed species of plants and animals were originated in two ways. (1) Certain members of an existing species undergo, generation after generation, slight, imperceptible changes of construction and habit, due to peculiarities of their environment, until they develop, first into a new variety and then into a new species. (2) A new species is suddenly created by the birth of an offspring utterly different from its parents. Prof. de Vries believes the latter method is the only one by which new species ever come into existence.

He brings a good deal of interesting evidence to support his position. He points out that plants and animals almost universally tend toward and not away from the average of their kind. Measurements were made of all the recruits enlisted in the Dutch army. It was found that almost all of them approached closely to an average. The tall and the short were extremely exceptional. In his garden at Amsterdam Prof. de Vries has experimented on a certain primrose which was imported from America, and which now runs wild in Holland. Among thousands of these primroses only two slight mutations were found in the course of a year. He transplanted the slightly changed plants, but their descendants speedily reverted to the original type. Then one day there was found a new sort of primrose, whose leaves were darker, whose foliage was denser, whose fruit was shorter and stouter, and whose seeds were larger than those of the plant from which they had sprung. Prof. de Vries also transplanted this new primrose by itself. It has shown no tendency to revert to the type of its ancestors, or to undergo further variation, but looks just as it did the first day he found it.

That he has been unable even partially to develop a species by preserving slight variations and at the same time has originated a wholly new species by preserving one sudden and great variation, certainly tends strongly to support Prof. de Vries' position. But it will take a good deal more than this to convince students of Darwin's writings that Prof. de Vries' modification of Darwin's theory is justified. Darwin gave to the world an enormous amount of evidence tending to show

that biological evolution takes place by the slow accretion of slight variations far more generally than by sudden, extreme changes in plants and animals. The theory of evolution, as imported from biology into other sciences, invariably involves the postulate that this is the way development of all kinds commonly takes place. Prof. de Vries' doctrine, if accepted, would work a revolution in evolutionary philosophy.

EVOLUTION AN ACCEPTED FACT.

How the theory of evolution has seized upon the intellects and imaginations of men and in a few years leavened the whole loaf of scientific and philosophic thought, and even of the thought of men who know little about science or philosophy, is, by the way, a story of almost romantic interest. Darwin is frequently called the "father of evolution." The title would more properly be given to Aristotle. More than 2,000 years ago the great Stagirite advanced ideas regarding the development of living organisms which modern science has proved correct. The term "evolution" was first introduced into biological writings in the eighteenth century. Descartes, De Maillet, and Robinet in that century caught fleeting glimpses of the right theory. Maupertius suggested a hypothesis as to the causes of variation which he thought might explain how all animals were descended from a single pair. Toward the close of the eighteenth and in the early part of the nineteenth centuries Erasmus Darwin, grandfather of the great naturalist of that name, Goethe the poet, Treviranus, and Lamarck—especially the latter—advanced remarkably correct opinions. But the time was not yet ripe. Religious prejudices dominated pious minds. Cuvier's theory of the immutability of species held sway in the scientific world. Lamarck was ridiculed. He was attacked even by Sir Charles Lyell, who has done more than all other men to add geology to the domain of the evolutionists.

SIMULTANEOUS DISCOVERIES.

But at last the stone which the builders had so long rejected was to become the head of the corner. In 1842, after having been for five years engaged, in spite of bad health, in gathering facts bearing on the question of the origin of species, Charles Robert Darwin, who had now retired to his historic home at Down, in Kent, "allowed himself to speculate" on the subject. With constitutional caution he delayed publication of his hypothesis until 1858. In that year he received a memoir from Mr. Alfred Russell Wallace, who was in the Malay archipelago, and found, to his astonishment, that Wallace had come to almost the same conclusions he had. He communicated the facts to Sir Charles Lyell and Sir Joseph Hooker. They persuaded him to read a sketch of his opinion along with Wallace's memoir at the meeting of the Linnean society on July 1, 1858. Immediately afterward Darwin set to work to compress the mass of notes he had accumulated and the next year appeared his epoch making book, "Origin of Species by Means of Natural Selection." The Darwinian theory excited the deepest interest throughout the civilized world. It was vigorously attacked. Persons who believed it inconsistent with Christianity assailed it with special violence. It was defended with equal energy and more

than equal ability, and has ever since gained ground upon its adversaries. The "Descent of Man," published in 1871, in which Mr. Darwin tried to prove man's derivation from the anthropoid apes, raised another controversial storm.

Darwin only attempted to prove that the various species of plants and animals were developed by the preservation of favored races in the struggle for existence. In 1860, almost simultaneously with the publication of Darwin's and Wallace's writings, Mr. Herbert Spencer announced his purpose of publishing under the title, "System of Synthetic Philosophy," a series of works which should trace the operation of the law of evolution through organic life, mind, society, and morality. Mr. Spencer was then a man forty years old. He suffered from chronic bad health. He was terribly nervous. Several times he was near death. For years he could never work more than four hours a day. Yet he stuck doggedly to his stupendous task for almost forty years, and at last finished it. In the ten large volumes of his "Synthetic Philosophy," Mr. Spencer applies the theory of evolution to the smallest protozoön as well as to man, to the ceremonial institutions of the savage, and to civilized life, to the smallest meteorite, and to the whole physical universe. Everywhere he finds evidences of that "dissipation of motion and integration of matter" which, according to his definition, constitute evolution. Spencer's writings are woefully hard reading, but they are the greatest of all expositions of evolutionary doctrine and have exerted a stupendous influence on modern thought.

The evolutionary doctrine, as elaborated by Darwin, Wallace, Spencer, and, in this country, by John Fiske, has, in fact, affected the thinking of persons of almost every degree of intelligence. It has penetrated literature until every man who reads is more or less of an evolutionist, whether he knows it or not. It appeals to common knowledge and common sense; and a philosophical doctrine that appeals to common sense can stand a good deal of prejudiced or speculative buffeting.

EVOLUTION OF LIFE.

No animal substance returns directly to the vegetable. It must first be broken up into minerals and gases. Nor will animal matter that is dead take on again the life force and retrace its steps into living forms. In order to generate life in the laboratory, as you have seen done here, we must enter this cycle of transmutation at the point of the circle where life would naturally begin if nature had produced the favorable conditions instead of man. It does not follow that because we cannot divert matter upon a tangent at any point of intersection we wish that 'life can only come from antecedent life.' At three quadrants of the circle all is alive—living mineral, living vegetable, living animal, and in the fourth and last quadrant of the circle all is dead. Then the life principle takes hold of the minerals and gases and starts them again upon their journey.

This life principle is magnetism (a form of motion) generated by evaporation; the more active the evaporation the more of the living force is generated. In mineral life the evaporation is caused by the direct action of heat upon moisture,

producing the magnetism which causes crystallizations of all kinds from that of the frost crystal on the window pane to the six-sided crystal of silicon, capped at either end with a beautiful pyramid, which marks the border line between the mineral and vegetable kingdoms. In vegetable life this evaporation producing magnetism is caused by chemical action, aiding that of mineral life in the building of organic compounds.

In animal life oxidization produces evaporation, which generates magnetism, adding a third force to the building of animal structures. Thus, the mineral has one, the vegetable has two and the animal three forms of magnetism in the building of their characteristic structures. All is magnetism, all its produced by evaporation, yet each in some manner differs from the other and is produced in a different way. True, it is not easy to draw the line of demarcation between the three kingdoms of nature, yet where we find the three forces combined, we find animal life being generated. Either form may exist by itself and produce its characteristic manifestations, all of which are so well known as to require no especial mention here.

Briefly summed up, this is the effect of two of the three causes known to exist as far as animal life is concerned. The ultimate cause is sunlight, acting under the different conditions already considered. The exciting is the affinity matter has for energy under these different conditions. But what of the determining cause? Why do these two factors act in unison along well defined lines? To this question there are but two possible answers. The determining cause is either intelligent or it is not. If we admit it to be intelligent and ever present in all the operations of nature then all is luminous; then there is no chance to be considered. But who can believe that all this splendid order and adaptation to a definite end is controlled by chance? Can chance determine definite results?

THE EYE.

There was certainly a time long ago when living creatures were not blessed with eyes. In creatures now living upon the earth we may trace a series of eyes from the highest and most efficient to the simplest dot of black pigment. The eye of the eagle may stand for the first, and the eight sense-germs of a jellyfish for the other extreme.

The eye of a jellyfish is so primitive that we can hardly say whether it sees or feels. That is, when a floating jellyfish begins to sink below the surface of the water as the shadow of an advancing ship falls upon it, it is probably affected by the sensation of darkness, but perhaps the pressure of the onrushing waves has something to do with it.

Disregard for a time the two bright eyes of the lizard, one on each side of his head, and look directly down on the centre of the skull between them. Here we will find an oddly shaped scale marked with a little depression, and this is, indeed, what is left of our Cyclopean eye in the tiny sand creature. Lizards doubtless derive very little benefit from it, as the nerve leading from it is very small, but in some of their ancestors it must have been of great value in detecting the presence of enemies from above. In all creatures above lizards this third medium

eye (called the pineal), is found, although of no use whatever; this persistence, perhaps, showing of what great importance it once was. In a chick in the early stages of incubation this eye is very considerably developed, while yet the paired eyes are but small structures. But suddenly nature seems to realize that the old regime has passed—that the little bird will need other more modern eyes, and the two side eyes begin to develop with wonderful rapidity, and soon catch up with and distance the Cyclops eye, whose early start ends only in promise.

WONDERS OF THE THIRD EYE.

A horse, a bat, a mole, a monkey, a seal, all have a trace of this third eye, and when we put a finger on the "soft spot" of the head of a tiny baby, we realize the wonderful import of it—that the softness is due to a near approach of this same third eye to the surface, striving as it has done in so many lower creatures to push its poor imperfect lens to where the light can act upon it. But the old ways have given place to new, and the child's blue eyes look out to you and the world and see all that is necessary for its life and needs.

Finally, let us turn to the most perfect eye nature has ever produced. We can read and write and do many things by the aid of our eyes that are forbidden to other creatures of the earth; but this is because of the brain behind directing the eyes. We can look closely at the stars, and we can watch the actions of a tiny dot of life many thousands of times smaller than a mote of dust. All this we can do by means of the two "magic tubes," the telescope and microscope. But when the unaided eye is alone considered, birds put us to shame. "Observe an eagle," writes a noted scientist, "soaring aloft until he seems to us but a speck in the blue expanse. He is farsighted; and, scanning the earth below, descries an object much smaller than himself, which would be invisible to us at that distance. He prepares to pounce upon his quarry; in the moment required for the deadly plunge he becomes nearsighted, seizes his victim with unerring aim, and sees well how to complete the bloody work begun. A humming bird darts so quickly that our eyes cannot follow him, yet instantaneously settles as light as a feather upon a tiny twig. How far off it was when first perceived we do not know, but in the intervening fraction of a second the twig has rushed into the focus of distinct vision from many yards away. A woodcock tears through the thickest cover as if it were clear space, avoiding every obstacle. The only things to the accurate perception of which birds' eyes appear not to have accommodated themselves are telegraph wires and lighthouses; thousands of birds are annually hurled against these objects to their destruction."

THE HANDS AND FEET.

Previous to the appearance of vertebrate limbs a series of manifold devices had originated by which the body could be transported from place to place and appropriate foodstuffs seized and carried to the mouth. These consisted of more or less permanent extensions of the body substances, naked or clothed in protective shields of denser material. In some types the limbs were created in the act of exten-

sion itself and were retracted by absorption and disappearance into the general body mass; in some they were formed of erectile tissues which could be protracted or withdrawn as occasion demanded; in some the whole body was thus contractile, and alternately elongated and shortened as the animal progressed; in some the organs of locomotion consisted of definitely formed limbs, which, while subject to loss by violence or even sudden shock, might be repeatedly and perfectly regenerated in the course of the individual life. In the forms to which they are molded and the mechanical principles upon which they depend, these organs of movement present the utmost variety, including ameboid extensions, flagellate cilia, pulsating bells, contractile stalks and bodies, suckered tentacles, swimming fins and tails, wings, and articulated legs. They appear as a great series of adaptive levels through which the evolution of this particular mechanism passed toward more highly integrated and developed types.

The earliest form of locomotion which vertebrate limbs fulfilled was propulsion through the water. The problem to be solved did not include the support of the body, which was buoyed up by the dense medium in which the animal moved. The same dense medium afforded a sufficient resistance to allow of a relatively slow and weak movement on the part of the locomotive organs. The earliest vertebrate limbs, or the body extensions which foreshadowed them in times still earlier, needed neither the strength and rigidity of the terrestrial leg nor the expanse and velocity of stroke of the aerial wing.

From this primitive terrestrial vertebrate limb, through a series of cleavages of, or buddings from, its extremity, giving successively two, three, and four-toed forms, arose finally the five-toed generalized type of mammalian limb.

Henceforth no important structural changes are to occur in the general features of the hand. Development is to take place chiefly through an increase in the facility and precision with which a variety of relatively simple movements are made, and the substitution, in ever increasing grades of complexity, of mechanical instruments for the use of the hand itself as a manipulative and constructive agent.

STRANGE FACTS ABOUT INSECTS.

Did you know that a cockroach, in spite of a well-developed nose, insists upon breathing through tubes in his body?

Have you observed that it is exactly eleven times as hard to kill a spider as it is any other insect?

Have you been told that ants have ears, but are deaf, and are especially fond of perfumes?

The most ingenuous scientific investigator is, for instance, entirely unable to tell you why a fly has its remarkable double set of eyes, and must inflate its wings like a pneumatic bicycle tire before it can fly.

Why nature provided the earwigs (that agreeable little bug that crawls into your ears when you are taking a nap on the grass) with an enormous pair of black-

smith's pincers fastened on behind the end of his body nobody can explain. The unfortunate creature is compelled to back up to whatever he wants to tackle, and his eyes being at the other end of his body, he never can see what his claws are doing.

Nor has the most thoughtful student been able to tell why nature produced the day fly—so named because the poor insect is born in the morning, rushes through its early childhood in about an hour, enjoys a brief middle age of not over three-quarters of an hour, becomes aged and wrinkled and feeble in the next quarter of an hour and has passed away before noon. Incidentally it cannot be explained why this short-lived insect should be burdened by two long, hair-like and useless stylets which it must drag on behind itself through its brief career.

HOW A FLY WALKS ON THE CEILING.

For a long time it was generally understood that a fly was enabled to walk along the ceiling upside down without falling because each foot was a miniature air pump. Better microscopes and more careful observation soon exploded that theory. It was then explained that the feat was made possible because the bottom of the fly's foot was covered with a sticky substance like mucilage. Still better lenses and further investigation now results in the present established scientific explanation that flies can walk upside down on smooth substances by the help of capillary adhesion.

A patient investigator has, by a series of nice calculations, weighed and measured the hairs on a fly's foot. He finds that a fly would be upheld by the capillary attraction even if it were four-ninths as heavy again as it is.

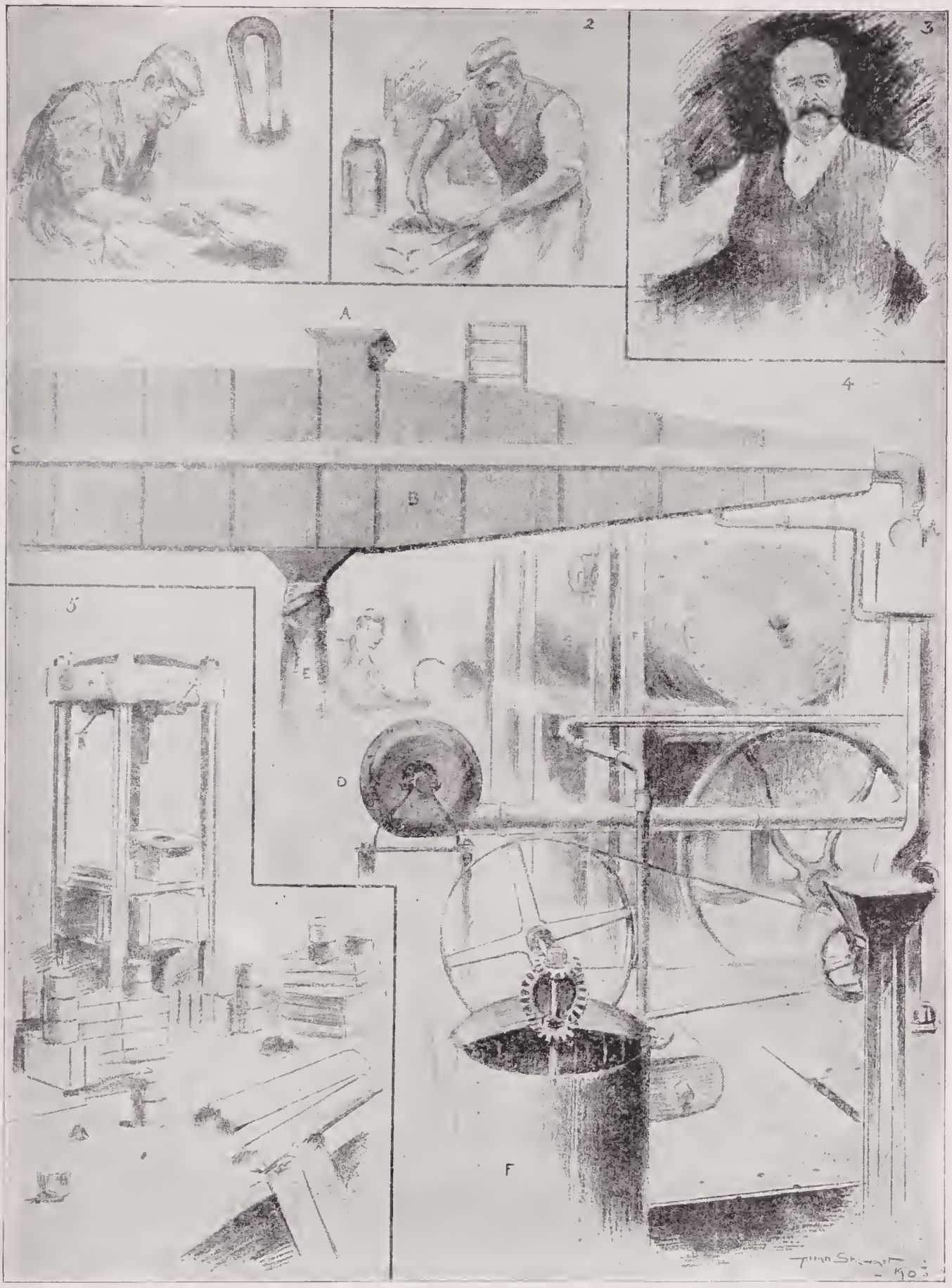
Every fly is estimated to possess about 12,000 very minute foot hairs. It is true that these hairs exude a slimy fluid, and it is because of the repulsion between a watery surface and this oily liquid that a fly finds it difficult to crawl up a damp pane of glass.

A fact little known by householders, but applied successfully by druggists, is that flies flee before the smell of sassafras. Druggists who sprinkle essence of sassafras over their soda-water counters are never troubled by flies.

The gnat is equipped with a stiff, sharp probe like a needle. This he pushes down into your skin and ejects a very minute particle of irritant, which makes the blood flow to the surface of the skin. As the probe sinks into the flesh the gnat's flexible, hollow sucker is pushed up. When the probe is inserted its full length and the local irritation has brought sufficient blood to the surface the flexible (and now more or less doubled-up) sucker begins to draw forth the blood from the little wound,

COMPOUND NOSES.

The cockroach, although its eyes are almost useless organs, being bent under its head as its mouth is, for convenience in eating from the ground, has compound noses, in number nearly equal to the compound eyes of the fly. Its eyes, because of their position, are practically useless. It may not see the approach of human foes, but the long, hundred-jointed filaments of its antennæ are ex-



Making iron from sand. 1 and 2. Demonstrating the principle of the process: (1) Separating the iron from the sand by a magnet. (2) Binding the iron particles together with the binding fluid. (3) Mr. Rouse, the inventor. (4) The machinery employed. (5) The mould in various forms of briquettes and pig-iron bars.

tremely sensitive to sounds. These filaments are dotted all over with depressions, which entomologists declare are not feelers, but compound noses, and that the first warning they receive of human intruders comes through the sense of smell.

Because they have a sense of smell so marvelously keen, they have been called the bloodhounds of the insect world. The cockroach has no lungs, but breathes through ten tubes on each side of his body, the tubes being tiny spirals like those of a door spring.

Spiders thrown into the water skim swiftly to shore, without even wetting their feet, this because the hairy claws upon their feet imprison the air and keep them dry. If they find themselves too far out for this pedal rowing back they return to dry land in a way that for a long time puzzled investigators of their habits. All they knew was that suddenly the spider stopped running, braced its legs and seemed to be borne along by some mysterious force.

It was observed that it was throwing off from the rear a tenuous silken thread, then another and another until the breeze was soon fanning a half dozen of the silken lines. Cunning Mr. Spider had swiftly spun his own sail, transformed himself into a sailboat and was scudding back to shore safe and triumphant.

SENSE OF SMELL IN ANTS.

Ants, while seeing fairly, being provided with one set of compound, and a set of simple eyes, are practically deaf. Penny whistles, violins and megaphones leave them equally unruffled. Their sense of smell is the most acute of their senses. When a brush wet with pachouli was placed near an ant hill the busy little denizens stopped their work and literally lay down in their delight, laying back their antennae in sensuous ecstasy.

While scientists have disproven the charming story of the prudent ants sowing rice and harvesting it for their winter use, and proven that they really sleep away the winter as lazily as do bears, there is no question but that the tiny insects carry on a thriving dairy industry. The aphis, which is a more poetic name than its common one, plant louse, are confiscated by ants wherever found. Some enterprising and selfish ants drive their treasure home and keep it for their own family use, but most of them having the community spirit, the aphides are kept in herds. Underground stables are built for them. Their conquerors even tunnel the way for them up juicy plants, so that in case of a foray by warring tribes of ants, there would be a hiding place for the prisoners of war. The aphis is valuable to the ant colony because it is the ant's Jersey cow.

In death, as in life, the ants are aristocrats and rigid observers of caste distinctions. For ants have their cemeteries, and it is characteristic that the poor aphides and other slaves captured in war are buried, not with their masters, but near the back fence, among the burdocks and ragweed, the potter's field of the ants' city of the dead.

The flea has no wings, and doesn't need any. He can jump farther in proportion to his size than any other insect. He is the kangaroo of bugs. He can jump exactly 100 times his height with-

out unusual effort. If a man could do that he could jump over the St. Paul building, New York, with ease and dispatch. The difference between the legs of the flea and those of animals is that the joints which attach them to the body are many times stronger. If the thighs of a fly were as strong as those of a flea he could jump as far and his wings would be superfluous. Or, if a man's thighs were as strong, proportionately, as a flea's, he could hop along the road and over the hills as fast as an automobile travels.

A SCIENTIST WHO SHOWS LIVING ANIMALCULAE THAT HE HAS CREATED.

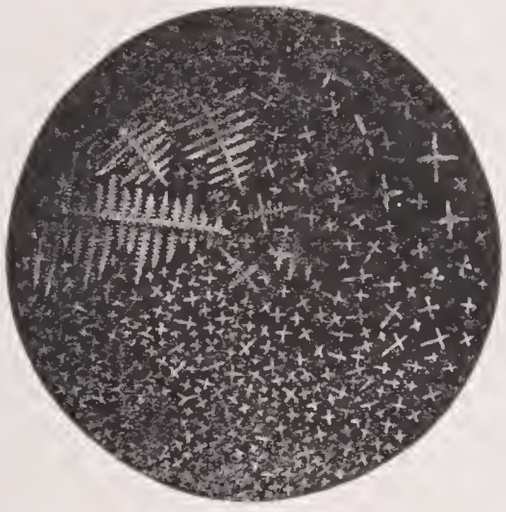
HIS THEORIES OF LIFE AND ITS ORIGIN.

In discussing his experiments Dr. Littlefield said:

"I have been busy with experiments as to the cause of death in the living protoplasm and I have worked out some interesting and important facts connected with this strange phenomenon of living matter. I have stated that 'life is produced by certain vibrations, acting on definite compounds of matter.' This I believe to be a correct definition of the ultimate cause of life—animal life.

THE PROFESSOR'S THEORY.

"After animal life is started it must be maintained. Here a new process obtains, that of feeding, or the conversion of foreign substances into protoplasm. This is a process of oxidation carried on in the cells of the protoplasmic mass. Now, just so long as this supply of new material exactly equals the waste in the act of living—mere living—death does not occur, or at least has not occurred so long as this equilibrium has been maintained. But with any increase of bulk or size in the mass by feeding, although all the other conditions necessary to life



No. 1. A very small portion of a dried tear, crystallized into queer-shaped fern fronds and crosses. Some of the latter are given still more magnified in No. 2. The actual size of the above circle, prior to magnification, was 1-10th of an inch. The crystals are formed of common salt, phosphate of sodium, and other ingredients.

No. 2. The above depicts a circle 1-20th of an inch in diameter, magnified, containing crosses of crystal found in a dried tear, and are a few of the many contained in No. 1 on a smaller scale.

are maintained, the dangers of death begin, and sooner or later the mass dies. And the phenomena of death! What startling wonders it reveals! During the time that 'life' dwells within the mass of protoplasm it is clear, transparent, jelly-like, capable of movement and nutrition. But as the life leaves it—for you can see it do this—the mass becomes rigid, opaque, incapable of movement and loses its jelly-like appearance. Before death the mass is insoluble in water, but after death it is easily dissolved and all of its ultimate material elements can be recovered in the original forms, together with the magnetic force generated by the vibrations. What, then, left it at death? Is it possible that the union of vibrations, with definite compounds of material elements, invites a third factor, whose presence is the determining cause between life and death and whose absence means death?

"While the living protoplasm can be made in large quantities, it requires several hours to develop into living forms, and then I am never quite certain just what form the protoplasm is going to assume; therefore an attempt to show these things to an audience might prove very embarrassing. One must study for hours to fully appreciate the wonderful work that is going on in the construction of living forms from inanimate matter. Nature's laboratory is out of doors, and she takes all the time she needs in doing her work, and the very best we can do is to imitate her in her work. Time and conditions are essential to success, and these we cannot always have before an audience. The very best we can do, then, is to tell and show the 'story' and let those who care to investigate the phenomena and substantiate the facts.

"Twelve elements enter into every living thing, and, according to Huxley, protoplasm is the beginning of every living thing.

GRADUAL EVOLUTION.

"Protoplasms break up into eggs according to environments, from which various living things are evolved. Environments so slightly different as to be unperceivable to the human mind and eye to a certainty control what the progeny will be, and so subtle, I say, are the forces of nature, so unfathomable her ways, that one cannot prophesy what will come of the protoplasm. The cutting off of a ray of light or a breath of air may be responsible for the changes which, after happening, we can see readily. It may be responsible in one case for imperfect wings, rudimentary or incomplete legs, or the changing into gnats or worms what under other environments and conditions might have been widely different.

"All elements start on their journey as inorganic minerals or gases, thence are transformed into organic compounds in the vegetable kingdom, and are used up by the animal world and returned to the earth in the form of gases and minerals. Thus they complete their cycle of change.

"Intimately connected with this circulation of the elements is the circulation of energy, though separate and apart from matter. Energy is not limited to our earth or its atmosphere. It streams to our planet with the sunlight, and, having run its course through mineral, plant and animal life, flows back again into illimitable space. It is as impossible to de-

stroy energy as it is to destroy matter. Both are self-existent and eternal; neither had a beginning nor will ever have an ending. Physical life is one of the manifestations of this eternal energy. Since man has the power to transform one form of energy into another by the use of various mechanical devices and chemical compounds, he can, by proper combinations, transform that expression of energy into life itself.

"It must be borne in mind that nature makes no leaps, nor can man do so, for there are certain well defined lines of progression which must be followed if we desire to produce definite results. This holds true in every department of nature. Those who sent forth to the world the scientific ultimatum 'that from the non-living cannot come the living' did so because living forms cannot spring up from decaying animal matter; they should have known better than to look for the beginning of life where it ends Animal life begins where vegetable life ends; where crystallization ceases in the mineral vegetable formation begins in the organic. Thus we have a well defined line of progression—mineral, vegetable, animal.

THE SCIENCE OF ATHEISTS.

"All atheistic scientists believe in a determining factor in every phenomenon. Can then blind chance determine to evolve mind? If, then, mind be not a factor in the transient phenomena of nature, what manifestation of this universal energy is nearest to mind? And by what apparatus can we transform it into mind? The answer that 'every form of life manifests intelligence' is no solution to the problem. This only proves my contention that mind is an ever present factor in all the operations of nature.

"If it be answered that 'brain substance transforms vital energy into mind,' I need only to remind you that intelligence is manifested in the lowest forms of life that has neither a trace of nervous matter nor brain substance. If you answer me again that mind is the product of the ceaseless activity of matter and energy I ask, 'Then can the least produce the greatest?' Can a stream rise above its source? And should you finally concede that mind is a product of life, I need only point to you the incalculable millions of examples of mathematical motions as proof of the presence of mind in the universe ages before the advent of life into the world.

"Admitting, then, that mind, energy and matter are the three factors which produce all the transient phenomena, what relation exists between the creator and the created? We have already seen the various stages of change through which matter passes in its various transformations in completing a circle of activity. We need only to study the law of the conservation of energy to trace its various expressions back to sunlight, whence it came. And what of mind? Does it go back, too, to the great source of being? Nay, I ask, does the body return to dust? Why not then the spirit to Him who gave it? But what of its individuality? The various manifestations of energy lose their identity in their ultimate source.

"The body mingles its personality with the dust of Mother Earth and is lost. Now what of the spirit? Does a mansion

lose its beauty when the scaffolding is torn away and the sound of the hammer is stilled? Or does it stand out in clearer perspective against the azure sky? But can it be shown that the ultimate purpose of life is to build a spiritual entity? It can, I contend."

LIFE IN CRYSTALS.

Dr. Littlefield took one ounce of common salt and mixed it with six ounces of pure water, six ounces of 90 per cent alcohol and two ounces of aqua ammonia.

This compound was distributed on five small plates, all covered by an air-tight glass tube. It required ninety minutes for the salt crystals to impregnate with the hydrogen, but at the end of that time the crystals, it is said, were transformed into living forces that immediately sought nourishment.

Microscopic examination showed that the crystals that were not affected by the chemical mixture retained their original cubic form, but the magnetized crystals assumed a hexagon shape.

"Life" first appeared in the center and spread until the crystals assumed a globular shape.

Dr. Littlefield has not yet determined whether the germs will propagate.

PROBLEM OF RESTORING THE DEAD TO LIFE.

Two German scientists, working independently of each other, have taken the first steps in the great problem of restoring the dead to life, and the results of their remarkable experiments have roused the interest of physiologists and medical men generally. The two physiologists in question are Drs. Kuliabko and Herzen, and their experiments have been made respectively with the heart and the brain.

Ever since the discovery was made a few years ago that life is a mechanical process, physiologists have been speculating upon the possibility of restoring the dead. Scientists first began their experiments upon the heart, because the beating of the heart and the pumping of liquids through the body seemed to be the most important of the functions by which life was sustained. The problem seemed to resolve itself into the question, How can a heart that has once ceased beating be made to resume its pulsations? The heart, it was claimed, was only a pump, and if the pump was mechanically in good order there seemed to be no reason why its valves should not be set going again.

HEART MUSCLE FORMS A THIRD CLASS.

The first experiments made in this direction were upon the muscular fibers of that organ. The heart seems to be composed of muscle quite different from all the other muscles of the body. Heart muscle, it is held, occupies a special place of its own in the muscular system, because, while it is not what is called voluntary muscle, yet it is different in structure from involuntary muscle, and men have been known who could regulate the beating of the heart at will.

Experiments with heart muscle fibers gave good results, and the fibers were made to beat in salt solutions. These experiments were made chiefly upon fibers

taken from the bodies of newly dead animals. But it has remained for Dr. Kuliabko to resuscitate the hearts of human beings dead for several days. He experimented with the entire organ itself and succeeded in causing perfect pulsation for a long time.

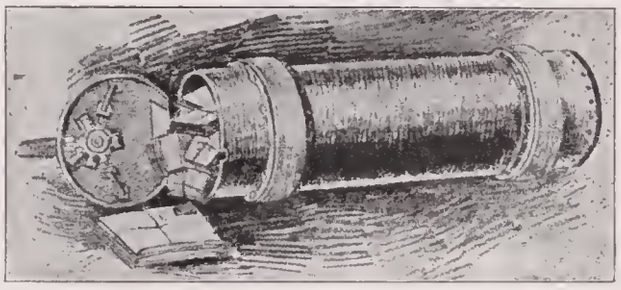
Dr. Kuliabko claims that there is a great difference between the vitality of mammals and of lower animals. The tissue of the former, he holds, possesses much more vitality, and therefore mammals take longer to die. Men's bodies, he says, die one part first, then another, and parts of the bodily machine keep on moving long after other parts have stopped, and even the separate and individual organs of the body die piecemeal.

Thus the heart does not stop beating all at once. One part of it stops first and then another, until finally all action in the organ has ceased. It has been found that the left ventricle is the first to stop and then the right, the auricles following. When the dead heart is started going again the action begins in the reverse order. No difference can be detected in the action of the resuscitated heart and that of a heart of a living man.

RESTORES BEATS TO HUMAN HEARTS.

The physiologist began his experiments on the hearts of rabbits and birds newly dead. These, he found, readily responded to action of the solution he passed through them. Then he took the hearts of rabbits and birds that had been dead for a day or two, and still succeeded in restoring the action. Next he worked upon the hearts of animals that had been dead for five days and succeeded equally well.

He now undertook to enlarge his experiments and to try the effects of his solution upon the human heart. The heart of a child that had died of pneumonia was fully restored, and the regular pulsations maintained for more than an hour. In one case, where the heart had long since passed into marked rigor of death, Kuliabko succeeded in fully restoring the organ to action in all of its parts and in maintaining the regular, rhythmic pulsation for a long time.



Compressed air mail tube carrying letters and small packages from one mail station to another in the cities.

He found also that the disease of which the patient died had much to do with the success or failure of the attempt at resuscitation. In pneumonia, cholera infantum, bronchitis, and catarrhal complications the results were good and the heart readily responded where the solution was applied. But in other complications less satisfaction was obtained.

Scientific men are never enthusiastic and never premature in jumping at conclusions or in making sweeping statements, but these astonishing facts are admitted to be a distinct step in the experimentation that has been going forward with respect to restoring the function of the heart after death. Kuliabko has actually made the human heart resume its

pulsation when that pulsation had been stopped for days.

STARTING BRAIN MORE DIFFICULT.

This is only the first step, however. The second step is more difficult still, but it would appear that Dr. Herzen has made it. The most important part of the complex machine called the human body is the central nervous system. The heart may be perfectly healthy, the pump in perfect order, but in order to make it go, power must be applied to its mechanism. Power is furnished by the nervous system, and the main depot of that system is the brain.

To start the brain going was found to be difficult, for it is a more delicately organized and more quickly decomposing organ than most others. Actual chemical decomposition takes place soon after so-called death, and certain acids are developed by decomposition which permanently destroy the fine machinery of the brain. It would appear that Dr. Herzen has solved this difficulty.

The heart works by the centractility of the protoplasm in the cells of which it is built up. And all that Kuliabko did was to start that protoplasm into action. Herzen argued that if the protoplasm of the muscle cell could be resuscitated by setting up in it the circulation of some fluid, there was no reason why the same thing could not be done with the cells of the brain, and he began his experiments on that assumption.

AWAKENS BRAIN OF DEAD RABBIT.

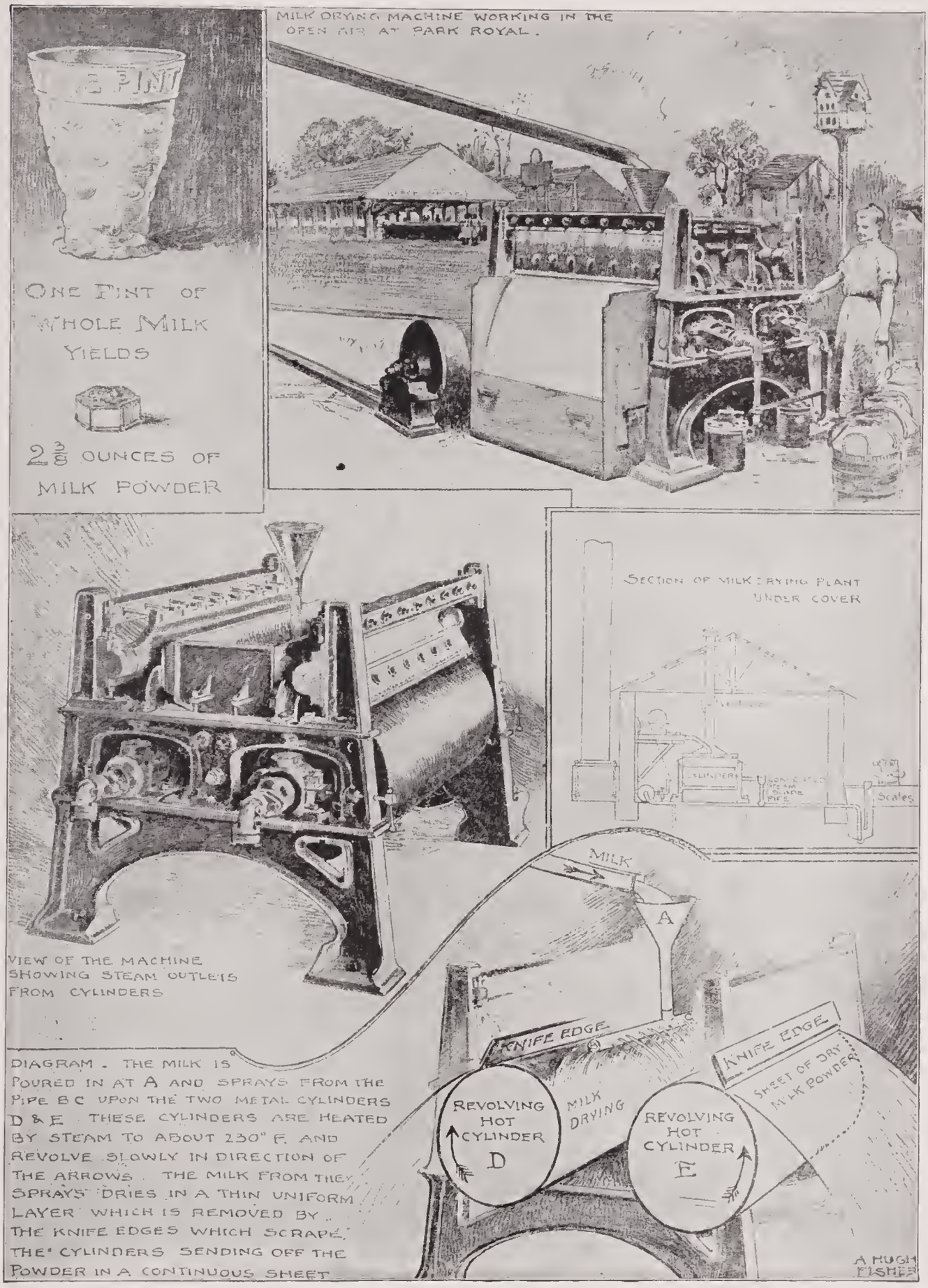
He has succeeded in restoring the mechanical action of the brain of dead rabbits by renewing the circulation in the dead brain. The brain will work if a salt solution be poured into it. So that Herzen in starting up a dead brain has done away with the theory that chemical decomposition forever destroys the mechanical power of the brain the moment a man is dead. Such, at least, is the opinion of even conservative physiologists, who, a short time ago, would have scarcely entertained the suggestion of such a thing being possible.

SCIENTIFIC EXPERIMENTS IN BRINGING THE DEAD TO LIFE.

The work of this scientist, Professor Elias P. Lyon of the University of Chicago, borders on the miraculous. He has succeeded in restoring life to a "dead" heart and has kept that vital organ beating normally for seven hours after it was removed from the body to which it formerly gave life.

By anatomists and physiologists the feat is regarded as one of the most remarkable in the history of scientific research. For this heart, with which the experiment was conducted, not only kept up its pulsation, but continued to pump a large volume of blood during all the time it was in action.

The successful experiment has given Professor Lyon and his associates reason to ask if death can not be deferred by the same means which kept this heart



Machinery for condensing milk into solid form. The milk is deprived of its water without the loss of nutritive qualities. At the same time all bacteria germs and spores are destroyed by the high temperature of the cylinders. The drying capacity of the machine is seventy gallons per hour.

beating. They believe they will be able to prolong life and keep a heart removed from the body beating indefinitely.

Professor Lyon, in connection with Professor Jacques Loeb, had previously proved that the heart was independent of the central nervous system. He decided that the only condition necessary for causing it to live after being removed from the body was to have it circulate blood through itself that it might extract therefrom sufficient food to keep it from weakening. When this condition could be met and the blood prevented from coagulating within the vascular passages he was satisfied that heart action could be maintained.

In a test which lasted from noon until 7 o'clock in the evening he proved his theory. How the heart was able to work automatically and how its rate of pulsation may be easily controlled was clearly shown.

In his experiment Professor Lyon used the heart of a dog. The lungs were left connected with the heart. After the animal was killed it required twenty minutes' time to remove the heart and lungs. It took still more time to cleanse the heart. Then came the task of defibrinating the blood—that is, removing the coagulating constituent.

The heart, with the lungs attached, was laid upon a glass plate. It showed not the slightest sign of life. A rubber tube five feet long was attached to the aorta, the large artery which conveys the blood from the organ. This tube is looped and connected with the lungs.

Professor Lyon then poured into the tube one quart of the blood, to which had been added a salt solution. To the lungs was attached an air pump, and with this the lungs were filled.

The heart lay dormant. It showed not the slightest inclination to resume action and it was, in fact, chilled by being exposed to the external air.

Catching the rubber tube above the point where the small artery which feeds the heart joins the aorta, Professor Lyon pressed slightly upon the artificial vessel and forced the defibrinated blood into the small artery leading to the heart. As soon as the blood penetrated the walls of the heart the organ began beating.

With a slow irregular motion at first it began forcing the blood through the rubber tube into the lungs and back through the veins into the heart. Within a minute the pulse, which could readily be felt in the rubber tube, became more regular. The walls of the heart rose and fell with a steady and quickening throb. By the time the organ had beaten 100 times the motion was as regular and only a very little more retarded than that of the living animal.

When the pulse of the heart became steady the lungs were again filled with air. The blood that passed through the circuit was returned purified by the air, just as it would have been in the living animal.

STOPPING AND STARTING THE HEART.

Many times during the afternoon Professor Lyon caused the heart to cease to beat. This he did by touching a small induction coil to the nerve which controls the heart. When this was done the organ palpitated, slowed its motion, and soon ceased beating. When it was de-

sired to start the circulation again Professor Lyon pressed slightly on the rubber tube, forced the blood into the heart, and it resumed its action.

During the course of the experiment attempts were made to determine the power of the heart as an engine. The three-eighths of an inch rubber tube was disconnected from the lungs and raised to a perpendicular position. The heart forced the fluid in a jet from the opening of the tube.

Most of the time the organ was kept beneath a glass globe to keep it at an even temperature. At times the heart was exposed to a current of cold air. This apparently had a deleterious effect upon the heart action, perceptibly decreasing the rapidity and force of the pulse.

While the experiment was designed to prove that the heart works independently of any control of the mind, it showed many other things of still more mysterious and wonderful character. The experiment proved that so long as the blood can be kept from coagulating, and so long as there remains in the fluid any food to maintain the energy of the organ, it will work. When it has assimilated the life-giving properties in the fluid it pauses and "dies."

Professor Lyon does not believe that a heart dies when the body is attacked by rigor mortis, or death. He believes a heart may be taken from the body, quickly and thoroughly cleansed with salt solution to prevent the coagulation of the blood and the damming of the capillaries, and that the organ can be started into action days after its removal from the body.

DEATH MAY BE DEFERRED.

Professor Lyon is not a dreamer. He has no weird idea of being able to cause man to live forever. He does not believe that animal life could be made perpetual. His experiments are conducted simply for the scientific truths they teach and for the new truths which they unfold. Yet he is confident that life can be reasonably prolonged, that in many instances death may be greatly deferred,

"Teddy," who travels daily through an underground mail tube to show its efficiency as a carrier.

especially where death results from a depletion of the blood supply. This he would do by filling the vessels with salt solution.

"It has long been known that the heart of a turtle will show signs of life long after it has been removed from the body," said Professor Lyon in talking of his experiment. "I have held that this is true because the turtle's heart works independently of the central nervous system, and the same is true of the human heart.

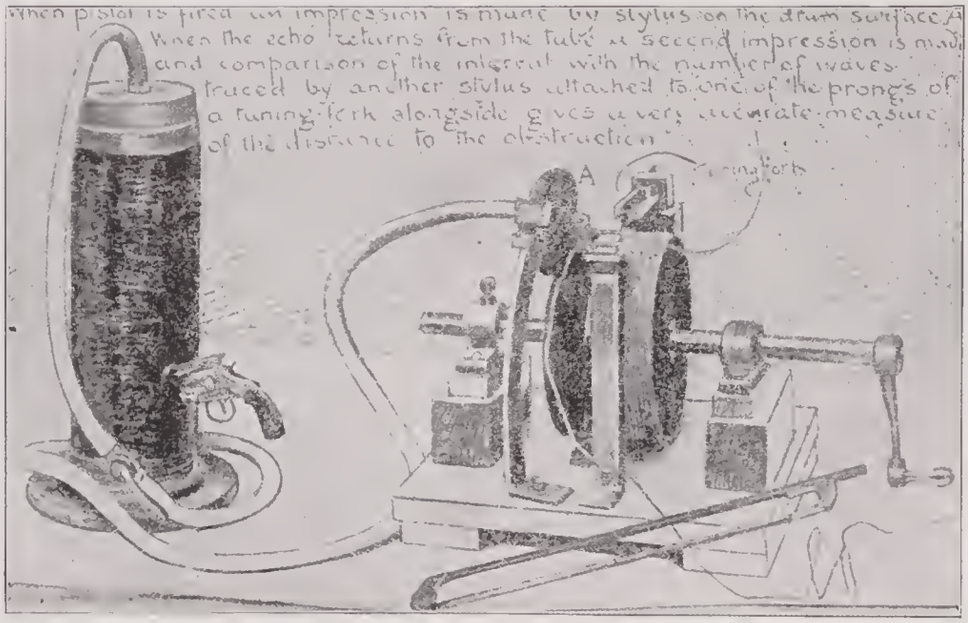
"The mind has an influence over the

heart, of course, for fear or our regular thoughts influence the heart action, but the heart does not depend upon the mind for its energy, or for the ability to keep up its action.

"There is nothing new in my demonstration that the heart can be made to show signs of life after it is removed from the body. But the circulation has not been reproduced artificially before nor has an artificial respiration been secured until I made my experiment.

not say. We know what is done. We do not know how it is done.

"We are approaching the time, if we have not already reached it, when we shall be able to defer death at will so far as the heart action is concerned. There are obstacles to this, but I see no reason why the heart action and the respiration could not be kept up artificially for an indefinite period with the heart remaining in the body. It would, of course, be necessary to cleanse all the blood vessels



Peculiar method by which the place of an obstruction is located in long underground tubes.

"We cannot tell where these experiments will lead us. There is a great void through which we must go blindly. Beyond it we will find out all man could care to know. I am satisfied we will be able to solve the great secret of life, for we have solved it in so far as its continuance is concerned. We are exploding the old ideas and theories day by day. I have just proved that the heart goes of its own accord so long as it is properly fed. Whence comes this energy I can-

just as I have done in this experiment. Death, absolute death of the body, would ensue before that could be accomplished. But I believe that some sort of heart action could be maintained after the death of the body.

SALT AS THE ELIXIR OF LIFE.

"By the use of salt solution we can prolong life to some extent. There is one kind of bleeding to death that is not generally understood. It is a gradual

depletion of the blood supply. The vessels are not filled with fluid and death ensues. If we inject a sufficient quantity of salt solution to fill the blood vessels we overcome the deficiency and the heart continues its pulsation. Without a complication the heart will continue to act as long as there is life-giving food in the blood. When that supply is exhausted we have death.

"The experiment I conducted successfully with the heart of a dog could be conducted equally well with the heart of a human. We are only at the beginning. Do you not see how wonderful are the possibilities? We can hold out no vain hope to man to expect to be endowed with an everlasting mundane life, but we have something now to work from which is almost terrifying in its possibilities."

THE MOST AMAZING, IF NOT THE GREATEST SCIENTIFIC DISCOVERY EVER MADE.

ORIGIN OF RADIUM POSSIBLY WIDESPREAD IN THE MATERIAL UNIVERSE.

No well authenticated discovery made in the last half century—not even that of the distance to which Hertz waves can be transmitted—has stimulated bolder conjectures than have the announcements of M. and Mme. Curie. What will be the outcome of this speculation cannot now be foretold, but already a number of amazing guesses and theories have been inspired by the properties of radium, considered apart from the other phenomena of nature.

Professor Rutherford, of Montreal, has created a sensation while lecturing before a scientific audience in London by suggesting that the earth is much younger than astronomers and physicists have believed. That possibility had occurred to him in consequence of observing the rapid rate at which radium decays. Supposing this to be uniform, he estimates that all which is at present in existence will have disintegrated in a thousand years, and that all which existed a thousand years ago must now have become transformed into something else—helium, perhaps. Professor Joly, of Dublin, reaches an astonishingly different conclusion concerning the earth's age, by confining his attention to the behavior of another metal, uranium. It has been observed in a laboratory that this metal apparently breaks down, but much more slowly than radium. Of a given amount of uranium only a ten-thousand-millionth part decays in a year. Adopting that element as a standard, then, the Irish physicist says that 10,000,000,000 years may be regarded "a minor limit to the antiquity of matter in our part of the universe." Rutherford and Joly cannot both be right, apparently, and perhaps neither of them is. Lord Kelvin's estimate of the time which has elapsed since the globe cooled sufficiently to sustain animal and vegetable life was between 10,000,000 and 20,000,000. Even the most exacting biologists and geologists demand more than 100,000,000. Professor Joly's guess exceeds these others a hundred or a thousand fold!

ORIGIN OF RADIUM.

A good deal of attention is now being given to the probable origin of radium. Whether the element, while still intermingled with other substances in the ores in which it is found, undergoes change as rapidly as it does after separation, is a question not yet answered. However, whether its fixity is greater in the one case than in the other, grave doubts of its permanence are entertained by most of the men who are now studying the element. A possibility which has occurred to several minds almost simultaneously is that radium is a product of uranium. The two were invariably associated in the pitchblende from which the Curies extracted radium. Dr. Bertram B. Boltwood, of Yale University, has made tests with various ores that lead him to think that the quantities present always bear the same relation to each other. W. C. D. Whetham, of Cambridge, England, says that every time he has obtained what was sold to him as a pure salt of uranium he would find traces of radium in it. He has also examined specimens of uranium compounds that have been preserved in the Cambridge laboratory for periods ranging from seventeen to twenty-five years, and in every instance they contained radium.

Finally, Frederick Soddy, who coöperated with Rutherford in some of the latter's earlier work, but is now identified with University College in London, reports in "Nature" a set of experiments which he is now conducting. He obtained a thousand grams of uranium nitrate twelve months ago. He purified it so that he could detect the presence of only a microscopic trace of radium. The proportion which the amount of the latter bore to the mass of the former would be represented with a "1" preceded by a decimal point and sixteen ciphers. At the end of a year Mr. Soddy tested again, and found a little more, but not as much as he thought he should have obtained if the added quantity came from uranium. There may have been something wrong with his test, or else with his computations, and Mr. Soddy will continue the observations from time to time. Inasmuch as the amount of radium discovered at the end of the year was only a ten-thousandth part of that which his and Sir William Ramsay's theories promised, he says: "This practically settles the question so far as the production of radium is concerned. . . . The result, of course, may be explained by assuming the existence of intermediate forms between uranium and radium. But . . . several such hypothetical forms, each with an extended life, must be assumed. So that, unless modifications are made in the theory which at present are not justifiable, the evidence may be taken as indicating that uranium is not the parent element of radium."

Rutherford, in a recent book, published before Mr. Soddy's letter appeared in "Nature," said: "Since radium has a short life, compared with that of uranium, the amount of radium produced should reach a maximum after a few thousand years, when the rate of production of fresh radium—which is also a measure of the rate of change of uranium—balances the rate of change of that product" (into helium).

Professor Joly, after briefly indicating the improbability that radium may be the

offspring of thorium, suggests that it may not result directly and solely from decay. Perhaps it may be a combination of the radio-active products of some disintegrating element with one of the many substances found in pitchblende. Particles and properties derived from either uranium or thorium might have united with bismuth or barium, for instance. "Thus radium would represent the synthesis, not the decomposition, of an element," Professor Joly adds. He therefore advises that a watch for the genesis of the new element in pitchblende and allied minerals be undertaken.

RADIUM ON OTHER PLANETS.

How extensively radium now exists, or has existed, in other celestial bodies than the earth is a question of profound interest both to astronomers and chemists. If positive information on this point could be obtained it might aid the experts in determining its origin and history in the globe. There has been a disposition to take it for granted that the stars are all composed of substantially the same materials. By the spectroscope it has been possible to identify with certainty nearly forty terrestrial elements in the sun. Lockyer thought that he saw evidence of several others—uranium among them—in the same luminous envelope of vapor. What is contained at greater depths can only be conjectured, but positive recognition of more than half of the elements found on the earth is certainly suggestive. A still more impressive fact is that a large number of stars—which astronomers say are also suns—give a spectrum like the great body on which the earth is dependent for light and heat. Arcturus and Capella are notable representatives of this "solar" type of stars.

Other types are characterized by different spectra from this one. Instead of showing the lines of calcium, iron, sodium and nearly two-score other metals, they betray the presence of little except helium and hydrogen gases. The suspicion is entertained, however, that the dissimilarity indicates differences in temperature only, and not of composition. Although the astronomers are not in perfect harmony concerning the meaning of the lack of agreement in stellar spectra, many of them look at the intensely white stars, which give a helium or hydrogen spectrum, as younger and hotter than the yellow, or "solar," stars; whereas the red, or "carbon," stars are considered cooler and perhaps older than any of the others. The practical unity of the material of which the whole visible universe is constructed is held to be possible, if not probable; and hence the particular elements which are the most conspicuous in any one group are accepted as indications of the stage of development attained by the members of that family.

RADIUM IN THE SUN.

No one has yet found evidence of the presence of radium in the sun. That fact proves little, though. Radium is one of the heaviest elements known. Astronomical spectroscopists have suggested that the failure to detect platinum, thorium and iridium in the sun and the dubious indications given concerning uranium may be due to their great weight. The same explanation would apply to radium.

There is almost as much reason for thinking that the latter exists in the sun and the other stars as there is to imagine that they contain platinum and uranium. The chief doubt is suggested by the belief of Sir William Ramsay that radium is an exceedingly "unstable" element, that the helium which has been obtained from it in a few instances was really a product of transformation, and that the gas was not simply liberated from a previous association with the metal. Of course, if all the radium which ever existed in the universe has now been converted into helium, and if a new stock of radium is not being manufactured out of other materials, then the supply has given out entirely. However, neither of these suppositions is yet warrantable. So long as one must rely on guesses alone, he is excusable for thinking that many other bodies besides the earth contain radium, though they do not show it. The case for transmutation has not been established, but even if it had been the theory would be applicable to the fresh manufacture as well as the disappearance of this strange element.

Whether or not the helium now observed in many of the stars has resulted from the decay of another element or has maintained its individuality as long as its associates, it is found in many of the nebulæ and in certain bodies which are involved in "cosmic fog." In these facts some astronomers find a hint that the Pleiades, the brighter orbs in Orion and certain other conspicuous helium stars are of comparatively recent birth, and that younger sisters are even now being developed out of the same chaotic and tenuous mist.

AMOUNT AND POWER OF RADIUM.

Sir William Ramsay, foremost of living chemists, says:

"All previous calculations in science are likely to be upset by radium. We may soon be compelled to revise some of the theories of physics that are now regarded as cardinal. Nobody can tell. The future open to the diligent laboratory student is fraught with mysteries. One thing is certain—nobody is likely to discover a mine of radium. Some statements made about the quantity of that precious substance in existence are absurd.

"I do not suppose there is one-tenth of an ounce of radium in the whole world. If you can imagine getting that amount of radium together, it would supply more energy than 250 tons of dynamite."

LATEST THEORIES OF RADIUM.

Radium is an element of extraordinary density. On account of this density, or, perhaps, on account of some other peculiarity of its constitution, the atoms of radium may not be so readily permeable by the ether as are the atoms of other substances. We may suppose that the radium which it contains presents a resistance to the ether. The particles of radium, being impermeable to the universal medium, act like small closed surfaces scattered through an otherwise perfectly penetrable sieve, and which set up a resistance when the sieve is moved, in proportion to their size.

Now, the motion arrested by an atom of radium is not destroyed, but simply transformed. It becomes energy within the atom, stored up there, only to be radi-

The Lamas or priests of Tibet. Their dress consists of gorgeous silk robes and long strings of beads, with little bells on the end which make a curious jingling sound as the men walk about.

ated out again in a form which may appear partly as heat and partly as electricity. Thus the strange power of a radio-active particle to keep itself constantly at a temperature several degrees above that of its surroundings, and to pour forth, without ceasing and without any perceptible source of supply, streams of energy, would be accounted for without any violation of the great law of equivalence which lies at the foundation of science.

The question may occur to the reader: "If the radio-active substances in the earth offer a resistance to the ether, why is not the earth brought to rest?"

No doubt the earth would be brought to rest upon this theory, if it consisted wholly, or in large part, of radium. But in fact there appears to be, relatively to its whole mass, but an infinitesimal quantity of radium in the globe, and so the retardation effected by it is imperceptible. On the other hand it is clear that if the earth should come to rest all of the radium it contains would quickly lose its energy, because the source of supply would be cut off.

There is another interesting application of this hypothesis. As many readers are aware, there is one of the periodical comets returning to perihelion every few years—Encke's, which for a long time has shown evidence of retardation, as if it were moving through a resisting medium. This peculiar conduct of Encke's comet has been a very puzzling phenomenon, because other comets do not exhibit a similar tendency. But suppose Encke's comet to consist mainly of radium; then, by the theory we are considering, we should expect it to be retarded in its motion through the ether.

As long as the real facts about such a mystery as radium remain unknown we have only the scientific imagination to lead the way to their discovery. And even in its errors the scientific imagination may present pictures as alluring as any that were born from the teeming brain of Shakespeare.

THE DISCOVERY OF POLONIUM.

Polonium, the new element which has been exploited in a series of most interesting experiments by Prof. W. Markwell before the chemical congress in Berlin, is really the discovery of a woman—one of the most learned women in the world, and one who is today recognized as among the truly great pioneers of chemistry. Married to a Frenchman, she is a Pole by birth, and it was patriotism that led her to give to her new discovery the name by which the world now knows it—polonium.

Scientists as yet understand too little of the marvelous properties of this new element to venture more than vague predictions of what spheres of future usefulness it may fill; but it is not improbable that it may be found to perform the present functions of the co-called Roentgen or X-rays far more powerfully and without the cumbrous apparatus now essential to their use.

OUTDOES EVEN RADIUM.

In a much higher degree even than radium it possesses the property of shining in the dark, and, although it is known that actual particles, infinitesimally small, are being shot out from it continually—a fact which is proved by magnetic experi-

ments—this strange substance does not seem to exhaust itself nor lose its luminous powers with the passage of time. Here, therefore, is a hint at least of the future possibility of a constant and brilliant illuminant generated without heat or combustion.

As a result of the discovery of this woman, Mme. Curie, she and her husband and a few chosen associates are enjoying at present a practical monopoly of a treasure mine richer far than one of gold or diamonds. Polonium is more valuable than radium, and Prof. Curie himself, who has a chemically pure specimen of radium not larger than a buckshot and weighing less than half a grain, would not sell it for $20,000. Strangely enough, the substance from which these precious grains of polonium are extracted is pitchblende, a sort of by-product found in Austria and heretofore regarded as valueless after it had been used for the extraction of uranium.

THE THEORY THAT MATTER IS A FORM OF ELECTRICITY.

SCIENTIFIC EXPLANATION OF ELECTRONS.

Electricity is not a form of energy any more than water is a form of energy. Water may be a vehicle of energy when at a high level or in motion; so may electricity. Electricity cannot be manufactured, as heat can; it can only be moved from place to place, like water; and its energy must be in the form of motion or of strain. Electricity under strain constitutes "charge"; electricity in locomotion constitutes a current and magnetism; electricity in vibration constitutes light. What electricity itself is we do not know, but it may perhaps be a form or aspect of matter. So have taught for thirty years the disciples of Clerk-Maxwell.

Now we can go one step further and say matter is composed of electricity, and of nothing else.

First we must ask what is positive electricity, and the answer is still we do not know. We may not even guess—beyond supposing it to be a mode of manifestation, or a differentiated portion, of the continuous and all-pervading ether. It seems to exist in lumps the size of the atoms of matter; and no portion of it less in bulk than an atom has ever been isolated, nor appears likely to be isolated.

But concerning negative electricity we know a great deal more. This exists in excessively minute particles, sometimes called electrons and sometimes called corpuscles; these are thrown off the negatively charged terminal in a vacuum tube, and they fly with tremendous speed till they strike something. When they strike they can propel as well as heat the target, and they can likewise make it emit a phosphorescent glow, especially if it be made of glass or precious stones. If the target is a very massive metal like platinum, the sudden stoppage of the flying electrons which encounter it causes the production of the ethereal pulses known as X-rays. Electrons are not very easy to stop, however; and a fair proportion of them can penetrate not only wood and paper, but sheets of such metals as aium-

inum and other moderately thin obstacles. That is because they are extremely small—much smaller than the atoms of matter.

Each electron has a definite charge of electricity—viz., the same charge as is conveyed by each single atom when a current is passed though a chemically conducting liquid. Every electron has also a definite and uniform mass, which is about 1/800th of that of an atom of hydrogen—hitherto the lightest known form of matter.

From every kind of material the same and no other kind of electron can be obtained, and we have reason for asserting that no other kind exists.

CAUSE OF ELECTRIC CURRENTS.

Electric currents are always due to the locomotion of these little electric charges; they permeate and make their way through metals, being handed on from one atom to the next, as a fire-bucket is passed from hand to hand. This is metallic conduction. Liquid conduction is different; the electrons travel with the atoms in liquids, and hence travel slowly, being jostled by the crowd, and being laden with the heavy atom which they convey or propel, as a pony (or a flea—in mass

Potala, the Dalai Lama's grand palace of the hitherto forbidden city of Lassa, Tibet. The scene of the signing of the treaty with Tibet: The golden-domed Potala, the palace of the fugitive Dalai Lama. The Potala is built on a bluff rock north of the city of Lassa. It is described as surpassing the most sanguine expectations. "Its golden domes," writes Mr. Edmund Candler, "shone in the sun like tongues of fire, making it a landmark for miles around. It must strike with awe and veneration the hearts of pilgrims arriving from the barren table-lands to visit the Sacred City." The British treaty with Tibet was signed in the Dalai Lama's apartments in this building on September 7, 1904.

a pony, but in bulk a flea) might drag a heavy wagon through crowded streets, until at the terminal station it is unharnessed and allowed to trot into its stable, which is what happens when the boundary between liquid and metallic conductors is reached. Electrons become still more emancipated, however, in rarefied gases, which act as a cleared race-course, or like a free range for flight; and then it is possible to find them, flying at prodigious speed, even as high as 100,000 miles a second, and sometimes faster still, but never quite so fast as light.

CAUSE OF RADIATION.

Whenever an electron is suddenly started or stopped, or made to turn a corner, it disturbs the ether through which it had been quietly moving and excites a ripple in it. These ethereal ripples constitute radiation, and the best-known variety of them we call "light." With this we have been familiar for a long time, because of our happening to possess eyes—instruments for the ready appreciation of ethereal ripples. We used not to know the reason, however, for the production of light. We know now that it is due to the sudden change of motion, either in speed or direction, of an electron; and probably to no other cause.

The charge in an electron is very small, but is extremely concentrated—that is to say, it exists only as a very minute nucleus; and in order to explain the manifestation of the observed mass of 1/800th part of a hydrogen atom by so trifling a quantity of electricity it is necessary to suppose that it is concentrated into a space one-hundred-thousandth of the diameter of a material atom. This is the size which is at present accepted for an electron. It is quite the smallest thing known.

Matter, then, appears to be composed of positive and negative electricity, and nothing else. All its newly discovered as well as all its long-known properties can thus be explained—even the long-standing puzzle of "cohesion" shows signs of giving way. The only outstanding still intractable physical property is "gravitation," and no satisfactory theory of the nature of gravitation has been so far forthcoming. I doubt, however, if it is far away. It would seem to be a slight but quite uniform secondary or residual effect due to the immersion of a negative electron in a positive atmosphere.

ELECTRICITY AS AN ANAESTHETIC.

Dr. S. Ledue of the Academy of Medicine, Paris, is confident that he has discovered in electricity a substitute for the great anaesthetics, chloroform and ether.

Necessarily, surgeons all over the world will be vastly interested should electricity prove to be a certain and safe anaesthetic, for chloroform, even when administered with the greatest caution, sometimes kills by its depressing action on the heart, and it is often most inconvenient to give ether, especially in surgical operations on the mouth and throat.

TRIES IT ON A DOG.

Dr. Ledue began his experiments on dogs, rabbits and pigeons. He employed a current of from ten to thirty volts, which he interrupted from 100 to 200 times a second. He sent this current through the brain of the animal or bird on which he was experimenting by applying one electrode on the top of the head

and the other at the posterior base of the skull.

In no case did more than ten minutes elapse before the subject was completely anaesthetized. They recovered immediately when the current ceased, and not one showed any evil effect.

SUBMITS TO TEST ON HIMSELF.

So confident was Dr. Ledue that this was a harmless and sure method to produce senselessness to pain that he submitted himself to the experiment. An assistant placed one electrode on the doctor's forehead and the other over his spine in the lumbar region, so that the mild but quickly interrupted current was sent through his cerebrum, cerebellum and spinal cord.

In less than ten minutes Dr. Ledue was perfectly anaesthetized. He did not feel the prick of needles nor the burn of a red-hot iron, nor did the pupil of his eye respond to irritation. When the current was shut off he recovered consciousness instantly, and so far from experiencing bad effects he declared he felt as if he had taken a tonic.

THE DYNELECTRON.

A recent invention, which is said to have for its object "the generation of electricity direct from the elements, heat, air, and water, without the intervention of either steam boiler, engine, or dynamo," is described at considerable length in a magazine published in the interests of the wireless telegraph system.

This new marvel of science and invention is called the dynelectron. If the claims for it are realized it will "ultimately displace the use of steam in the creation of power wherever it is now used."

The inventor of the dynelectron is James H. Reid, an engineer associated with the Westinghouse and General Electric companies. In his descriptions of the marvels accomplished and to be accomplished by his new invention Mr. Reid assures the public that within a short time the dynelectron will supersede the present cumbersome locomotives on all the railroads of the country.

No trolley wires or third rails will be needed, as the dynelectron will itself create the electricity needed to propel the train and will send the current to the motors connected with the axles of the cars. The cost of operation of all electric and steam railways, according to Mr. Reid, will be thus cut in two.

For light and power plants the dynelectron has an equally brilliant future predicted for it. Engines, dynamos, and boilers are to be superseded by the new device for generating electricity, since fully half of the present expense of operating an electric plant will be saved. Mr. Reid even declares the new invention can be attached to any furnace and made to furnish the electric current for lighting private residences at a cost within the reach of all.

While many of the extravagant claims in the Marconigram remind us of "thoughtless thinks by wireless telegraph," the description of the dynelectron itself conveys a hope that another important step toward the solution of the problem of making electricity direct from coal, without the intervention of steam, has been taken.

The invention consists of a huge lat-

tery composed of carbon and iron in a mixture of chemicals, which, when sprayed with water, furnished with a blast of air, and heated to 350 or 400 degrees, will give off a current of electricity. Tests have proceeded to the point where the business associates of the inventor say they are about to install two commercial plants of considerable size.

The problem of producing electricity directly from coal is recognized as one of the most important, from a commercial viewpoint, confronting the industrial world. Inventors of great ability all over the world are working upon it. Scores of devices of merit have been brought out by these men and considerable progress has been made by them. While it is unlikely that the dynelectron is the much sought for invention, it is possible that it will help in the ultimate discovery. And when the latter comes many of the claims now made for the dynelectron will be realized.

THE ASTRONOMY OF ATOMS REVEALED BY RADIUM.

The new theory of matter now being developed by Professor Lodge and others may be called the astronomy of atoms.

It shows that what has always heretofore been regarded as the smallest division of matter known to nature—the atom—is really composed of a multitude of infinitely smaller things named electrons, which revolve about one another within the confines of the atom in paths resembling the orbits of the earth and the other planets composing the solar system, and that instead of being packed closely the revolving electrons in an atom have proportionately as much free space about them as exists between Mars, Jupiter, Saturn and the other members of the solar system.

Thus the body of a man composed of innumerable atoms may be likened to the universe in that it is made up of a vast number of systems almost infinitely small in comparison with its own dimensions. Moreover, the manner in which the electrons constituting an atom revolve about one another resembles the manner in which the planets, comets, asteroids and meteors of the solar system travel in their concentric and in some cases interlacing orbits, and the principles of celestial mechanics, perfected by Newton, Laplace and other mathematicians to account for the motions of the heavenly bodies, avail to explain also the movements of the infinitesimal electrons of which atoms consist.

MATTER TRANSFORMED INTO ELECTRICITY.

But these electrons, while they constitute the atoms of which all material substances are made up, are not themselves conceived as being a form of matter. Experiment indicates that they are purely electric in their nature. Yet when combined in the shape of atoms they furnish the basis of what we know as matter.

While only radium and a few cognate substances continually give off particles in sufficient abundance to reveal the fact to us, yet the theory under consideration assumes that all atoms of all substances whatever are slowly tending to dissipate themselves in this manner, and that in the course of infinite time the whole universe

will thus be changed in its atomic constitution over and over again through the alternate dissociation of atoms and their reformatio in new combinations.

Already it has proved possible to calculate the number of electrons contained in various kinds of atoms—for instance, seven hundred in an atom of hydrogen, fifteen thousand in an atom of sodium, and more than one hundred thousand in an atom of mercury.

Thus the number of electric worlds, if we may so speak of them, contained in the miniature solar system represented by an atom of mercury is far greater than that of all the known planets, asteroids and comets in the solar system in which we live.

SUBSTANCE AND ELECTRICITY.

CAN MATTER BE SUBDIVIDED TILL IT IS ONLY ENERGY?

When matter is disintegrated into its final or corpuscular condition it is impossible to distinguish any difference between the corpuscles and electricity. This is but one way of saying that the entire sidereal universe and everything in it is made of electricity.

Electricity is matter beyond any doubt; but for years it has been called a mode of energy. This philosophy sounds like saying that matter and energy are identical and both are included under one word —electricity. To get at this in another way, it may be said that no entity exists but electricity. If so, and it certainly looks that way, then the human mind is made of electricity, and electricity is matter.

This brings us around to a point in Oriental speculation, 4,000 years in the distant past, when the wisest men the world has ever contained said over and over again that "thoughts are things." This idea has never died out; for from that remote epoch some psychologists have kept the primeval belief alive. And the doctrine is at this moment spreading over the world again with remarkable rapidity. Mail received here from all parts of the world contains this phrase repeatedly. "Thought power: the force of thought"; "transmission of thought power" and similar sentences bristle in the books, papers and the multitudes of letters daily pouring into this observatory. Electricity assumes more forms than did Proteus of old.

These "bodies smaller than atoms" have the property inertia, and other attributes of matter, yet none so far is able to tell us where they differ from electricity. It may be well to state that some scientists assert that they are not electric, but no proof has been coming.

Radium now in New York that was received from Paris in 1900 is still giving out heat and light. It therefore must receive matter which it transforms into heat; but if heat is electricity, and electricity matter, then there is a flow of matter throughout all space; for the spectroscope sees matter in the distant glowing suns in all directions in the same phases we are familiar with here on our speck of earth.

THE HOPE OF THE DYING SOLDIER.

SCIENTISTS MYSTIFIED.

Chemists, physicists and electricians are working night and day to find what matter is, and psychologists are working also day and night to find what mind is. At the present stage of investigation it looks as though both are one and the same, and that the most common form in which they appear is electricity.

The entire speculative portion of the scientific world is racking its brain striving to interpret the flood of mysteries that is submerging the human mind with inscrutable problems. The intensity of gravity is well known, and it has been measured with accuracy. Thus: Two spheres, say of gold, lead or granite, whose weight is 463,915 tons each, and whose centres are one mile apart, would attract each other with a force of one pound.

The electrical potential of that vast mass of corpuscles saturating all space, for long called "ether," has been computed; and there is a remarkable relation between them. The deductions are intensely mathematical and were made by Bergen Davis of Columbia University, and here are his conclusions in his own language: "This rather remarkable relation between the gravitational constant and the constant of the ether is very suggestive.

"It appears to me that this coincidence can hardly be accidental. If mass is electromagnetic, the constant of mass attraction might be expected to be related to the constants of the ether. The above result not only suggests that matter is electrical in constitution, but that gravitational force is the same in kind if not in degree with electrical forces, and that they act in a common medium."

Scientists for years have now and then written that gravity is probably electrical, and now it appears that mathematical proof is on the way. But man's place in nature and his relation to matter, or "electricity," is attracting attention all over the civilized world now. It is certain that "finer forces" exist in the universe of which man is at present ignorant. Thus: One of the most conservative scientific men of England, "Sigma," says: "The real question is just whether nature consists of Matter and Force—the known physical agencies—or whether it must not include another order of existence, the psychical, to which is due those phenomena called Life and Mind."

THE ANCIENT BELIEF IN THE TRANSMUTATION OF METALS REVIVED.

Sir William Crookes, the inventor of the famous Crookes' tube, which was used by Roentgen to produce his X-rays, is foremost among the chemists who claim that the metals, not only, but all the other elements, are convertible one into the other.

ON THE BORDERLAND.

"We have come," said Professor Crookes not long ago, "to the borderland where force and matter merge into each other."

According to the theory held by these advanced chemists, it is not radium itself

that causes the strange phenomena that occur in the presence of that element, but these phenomena are due to what the chemists call the "radio-activity" of the substance. When radium is obtained the element gives off rapidly a gas which, it chemistry that has so rapidly developed within the past few years.

These facts, say the specialists, have the most important bearing on the question of the transmutation of the metals, and the time may come soon when gold

The remains of a man of the Stone Age, discovered in Gough's Cave, Cheddar. The bones of a man of the Stone Age, with his weapons around him, were recently unearthed in Cheddar. A few feet away from the remains, which were found under a stalagmite floor six inches thick, ran the cable by which the electric light was supplied to the cave. The flint knives and flakes also found are shown in the foreground of the photograph.

is believed, is argon, or a number of gases belonging to the argon group. When the radio-activity dies down there is left a quantity of helium, but a slowly and constantly increasing quantity of that element. Argon and helium were only recently discovered, and they are two of the most interesting elements in the new can be manufactured in any desired quantity by the use of the radio-activity process on a large scale.

SUGGESTED BY YTTRIUM.

This possibility was suggested by the peculiar conduct of yttrium, another newly discovered element which gave evi-

dence in the spectroscope of changing itself into seven different metals, five of which were beyond the reach of the ordinary methods of chemical analysis. So that here, the physicists had under their eye a process by which a single metal was changed into seven different metals, all of them familiar to chemistry.

This interesting process was practically, so claimed the experts, a laying bare of nature in the very act of manufacturing in her own laboratory a number of metals which are quite costly when obtained by various methods of reduction from nature herself.

The contention is made that nature is constantly at work trying to break down the heavy elements into lighter elements. All elements have what is called atomic weight. The atoms of all elements are measured by the weight of one atom of hydrogen used as a standard.

NATURE'S PLAN REVERSED.

Gold is a very heavy element. Compared with hydrogen its atomic weight is 196. That is to say, gold weighs 196 times the weight of hydrogen. The time was, say the chemists, when nature was reducing the lighter elements to heavier ones, when nature was making gold out of lighter substances. The effort of nature now seems to have been reversed. It is now trying to reduce the heavier elements to lighter ones. But this contention is really the admission of the more remote contention that there is some great primal element out of which all the elements are built up—the "element of elements" itself. This element of elements has been called "protyle," and in the wonderful transformations that seem to accompany the activity of yttrium and of radium, this substance protyle is rapidly changed from one metal to three, four, five, six or seven metals, one after another or all at once.

And here is where the practical man is very closely concerned with these somewhat interesting phenomena. For, it is argued, if chemists can lay hold of this great primal element of protyle—something which Professor Crookes seems to hint at when he says that chemistry is on the borderland where force merges into matter—it would appear that the problem of manufacturing gold is rapidly nearing its solution.

A chemist in London recently suggested the probability that the money systems of the world might be seriously affected by these new advances in science, but he did not seem to regard the prospect from anything but a purely scientific point of view.

SOLIDIFIED AIR.

INCALCULABLE POWER READY FOR USE.

At first the mention of solid air appeals to one's sense of humor. The idea of being able to grasp a chunk of atmosphere, and hurl it through itself, so to speak—throw it through space seems to be preposterous. Yet it is a fact, and a fact charged with a thousand important possibilities.

The discovery of solid air was made by Prof. A. L. Metz of the Tulane Uni-

versity, Louisiana. The actual discovery was made a few years ago, but the experiments were far from complete, and little was known by the professor of the greatness of his discovery. Since he first succeeded in solidifying atmosphere, however, he has had many opportunities to made observations and further experiments, with a result that the importance of the discovery has largely been brought to light.

Prof. Metz has tried to find out the temperature of solid air, but in this he has failed to date. It is much colder than liquid air and will remain longer in its created state.

Prof. Metz estimates that solid air would register 820 degrees below zero if the mercury could be kept from freezing while the test was being made. But no thermometer has yet been made that will register the temperature of solid air.

The substance is not curious to look upon. It appears very much like a block of ordinary ice. It is transparent and has veins running through it after the manner of ice that has been subjected to great pressure. It appears to be formed in strata, though its toughness argues silently against this belief. Prof. Metz tried with every means at his command to smash a piece of solid air, the chunk being not larger than a walnut. He used all his strength with a blacksmith's sledge hammer, delivering a blow of great force, but the air remained intact and the heavy hammer rebounded as though it had struck a rubber cushion of tremendous force and elasticity. The average hammer will bound from solid air like a boy's rubber ball rebounds from the ground.

L. of C.

ENORMOUS FREEZING POWER.

Another peculiarity of the substance is its enormous attractive and freezing power. Anything that touches it sticks to it. A slowly delivered blow from a hammer will result in the hammer remaining firmly attached to the air. It requires a sharply dealt blow of great force to counteract this attraction and secure the rebound.

One looks at the substance in absolute wonderment. A few years ago we could conceive air only as a gas. Then came liquid air, and the world wondered. Had one suggested the possibility of solidifying air he would have been regarded as a man destined by nature for the lunatic asylum.

Prof. Metz's tests show that solid air has a highly explosive quality, and there is no doubt that it will play a most important part in warfare before many years have passed. Its penetrating force is almost indescribable, and its use will be far greater than that of liquid air, because it can be controlled so easily. Liquid air fizzles and boils away so quickly that it is almost impossible to do anything with it. Not so the solid substance. It practically paralyzes everything with which it comes in contact.

Like all great discoveries, simplicity was the dominant note of Prof. Metz's experiments. It is a well-known law that rapid evaporation causes a marked lowering in temperature. Prof. Metz, of course, was familiar with this law, and when it was announced to the world that liquid air had been discovered, and that it was so cold that it would boil by reflex-action on being brought into contact with ice, he saw at once, that being in liquid

form, if it could be solidified, a still greater intensified coldness could be secured. And so he sat about to prepare an apparatus that would evaporate liquid air in the shortest possible time. The apparatus is simple, yet quite ingenious. It acts by creating a vacuum over the surface of the liquid to be evaporated.

The apparatus consists simply of a test tube, and a bent glass tube connecting the test tube with the vacuum. Prof. Metz found this system of solidifying air perfect in attaining results. He first used the test tube—about eighteen inches long, little more than an inch in diameter—filling it with liquid air to within about six inches of the top. Then he corked it, and later connected it with the vacuum apparatus by a glass tube, bent in shape, and forced through the cork.

SCIENTIFIC EXPERIMENTS.

The liquid air stood at a temperature of 312 degrees below zero. Immediately the connection was made with the vacuum, a startling disturbance commenced to manifest itself. The liquid air began to sizzle and bubble just after the manner of water exposed to great heat. In a short time the cold became so intense that the atmosphere air outside the tube began to condense and run down the tube, dropping to the experimenting table, just as drops will fall from the outside of a glass of iced water in the summer time. In a few moments the liquid air had assumed a new character. It solidified and bore the appearance of a reasonably clear chunk of ice.

Clearly the experiment was a success, but it remained to examine the substance created. The glass tube was broken. Immediately the temperature of the room fell to an alarming extent. Indeed, it became so cold that it was with difficulty that the professor continued his observations. The block of air was less than an inch square.

On a second experiment the drops of condensed atmosphere that ran down the sides of the testing tube were caught and found to be identical with the liquid air inside of the tube.

In order to test the toughness and ductility of the solid air Prof. Metz placed a small chunk on an anvil and delivered a tremendous blow with a heavy hammer, and, as stated, the hammer rebounded as if it had struck solid rubber of great resistance. All efforts to smash or to crack it failed.

A special pair of pincers were prepared to handle the substance. As soon as they were within a sufficiently close range they were attracted to the air as a magnet attracts a needle. With a snap they at-attached themselves to the side of the substance, and it required a great deal of strength and much manipulating to free them.

The flesh touched with solid air is burned as if touched with redhot steel and a nasty wound is left. The faintest touch is sufficient to produce this effect. Indeed, only the faintest touch is possible with safety. Death would soon result from a continued application.

A steel rod more than a foot long held in the hand and applied to the block of air conveys to the hand a sensation of tremendous heat—so great that one does not know whether it is heat or cold. It is

impossible to hold the position more than a moment, a sense of paralysis coming over the entire body.

THE USE OF SOLIDIFIED AIR.

As a practically useful product, Prof. Metz expects solid air to find an important place in the forces used by man. Its tremendous power has been proved. It is expected to be of untold benfit to coal miners. Frequently noxious gases prevent working a mine in sections, and enormous loss of material and time results. It will be possible with solidified air to alter this condition. A cylinder charged with solid air will send its force outward, as from the mouth of a cannon and sideways, when released. This, driven through the strata of the coal, will accomplish silently the same results as dynamite, and, at the same time, as it travels, solid air gives off almost pure oxygen. Thus the atmosphere will be cleared and allow of men working after the shattering process has been completed.

As an explosive the possibilities of solid air are amazing. Naturally the experiments have to be conducted with great care, but Prof. Metz is working along this line, and he promises to produce an explosive that will set the world to wonder. His theory is that if he can suddenly turn the solid air into gaseous atmosphere he will create an explosive to which dynamite is like a Chinese firecracker. It is quite possible to conceive of no substance put together by man being proof against such an irresistible force.

Roman wire cable dug up in Pompeii showing the metal-working knowledge of that time.

FATHOMLESS WONDERS OF ELECTRICITY.

LOW CURRENTS DEADLY, HIGHEST CURRENTS HARMLESS.

To produce the full brilliancy of the carbon filament in an incandescent lamp bulb, a current of 110 to 120 volts is normally used. Imagine a current of sufficient voltage to light 9,000 such lights and an adequate idea of the meaning of a million volts may be secured. It is this current that will pass through the body of one so devoted to science that he will make the experiment to prove that what he has worked out in theory is possible in practice.

The voltage of certain forms of the lightning flash have been estimated at from 100,000 to 5,000,000 volts and it is believed that flashes of the higher voltage are those responsible for such curious phenomena as tearing off a man's clothing and melting the coins in his pocket without injuring him beyond a shock to his nerves. On these and other similar observations Prof. Thomson bases his belief that a million-volt current is as harmless to the human body as light or sound waves which pass around it without damage. Fatal accidents from live wires carrying 6,600 volts are numerous enough to fill the average person with a wholesome fear of the effects of such a current. This is the common voltage at which the current for the electric light and power substations is generated, and to touch the bare wires carrying such a load of electricity means instant death.

CURRENTS DISORGANIZE NERVES.

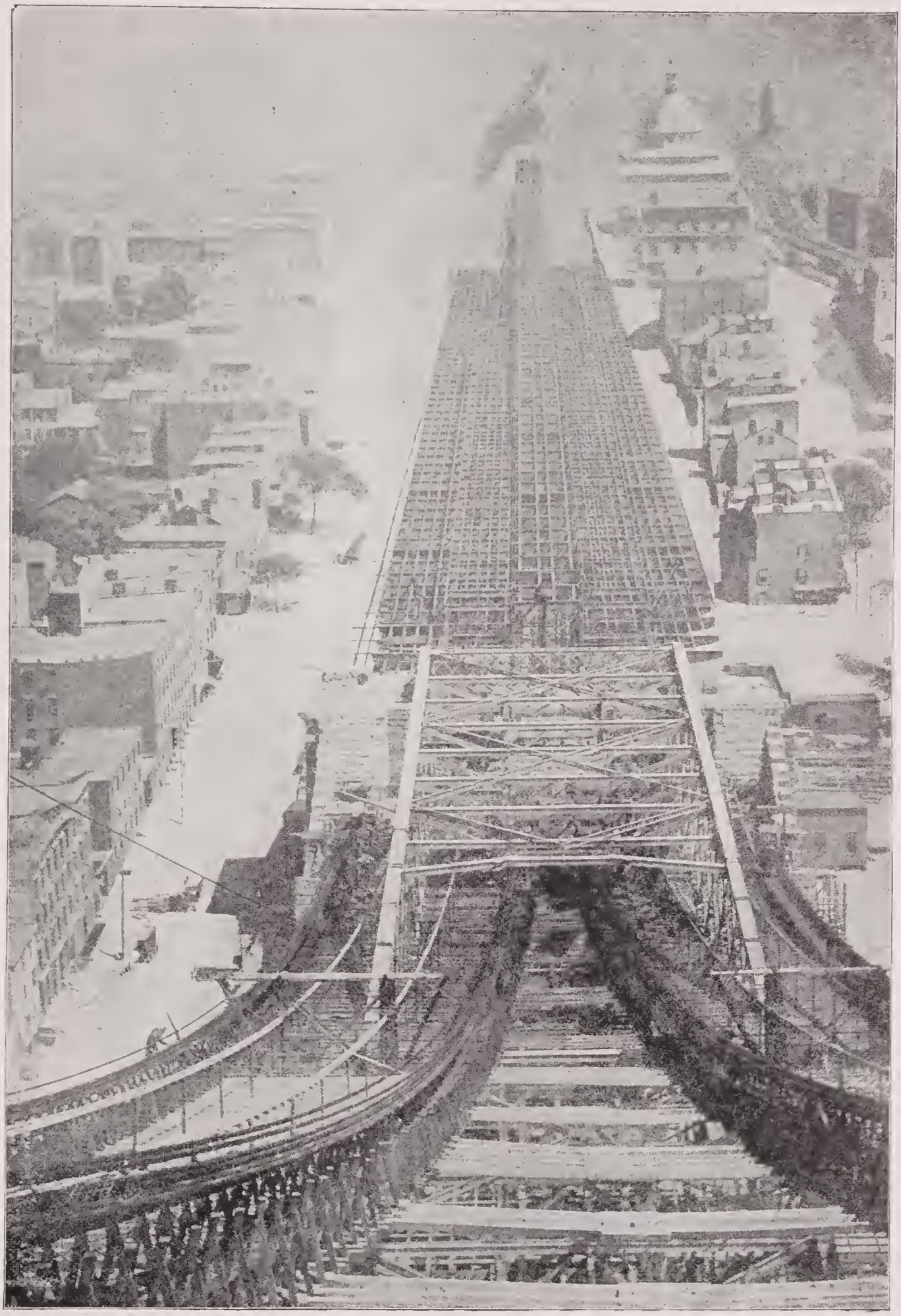
Electricians who work in the power houses and substations know this, and every year a number of the men resign lucrative positions because their nerves become undermined by the continual imminence of death.

In one of the large eastern stations, where the current is generated by water power at a tension of 10,000 volts, none of the original switchboard men of five years ago are now in the employ of the company. Each, on resigning, has declined an increase of pay with the words:

"I can't stay. I've lost my nerve."

The public mind is imbued with the idea that a current of high voltage is most dangerous. This has been borne in upon them by loose statements of popular writers who fail to distinguish between volts and amperes.

Prof. Thomson's experiment shows that a million volts can pass through the human body without effect other than a mild tingling sensation, yet the same current passing through the air will make a noise like the firing of a shotgun. In this current only enough amperes will be used to make it perceptible, and when the current passes through the arms of Prof. Thomson only a fraction of an ampere will be left after the raising of the volts to such a high figure. In the calculations of the electrician, one volt multiplied by one ampere produces one watt. If 200 watts are used at the start when the voltage is 100, two amperes would be available. Raise the voltage to a million or a billion—if the latter were possible—and the amperes become negligible. No matter what the voltage, the product of volts and amperes must give the same number of watts as were pres-



View of Brooklyn from tower of the unfinished new East River Bridge.

ent at the start, for this machine does not create energy, nor does any other.

By a simple calculation it will be found that the amperage of the current which Prof. Thomson lets pass through his body has only one five-thousandth of an ampere.

It takes more than ordinary nerve to thrust one's own body in the gap across which will leap that terrifying spark. Those who know most about the current will be most chary of interposing their flesh and bones in the path of a flash of lightning where the jagged stream passes with noise of a thunderbolt.

LATEST WONDERS OF WIRELESS ELECTRIC CURRENTS.

Wireless telegraphy has passed beyond the experimental stage, and is now an established fact, a commercial success, recognized as an investment, and a commodity that may be speculated in on the stock exchanges. The Russians got all their news from Port Arthur in that way. The United States army has utilized it in its annual war maneuvers for at least two years; the German, French and Italian armies are using it at their mobilizations; there is an outfit for receiving and sending dispatches on every up-to-date man-of-war, and one of the transatlantic lines publishes a daily newspaper while at sea containing news received through the currents of the air. The United States weather bureau has adopted it.

DESTROYING WIRELESS DISPATCHES.

Colonel Corbin of Jamestown, N. Y., has an apparatus by which he claims that he can destroy wireless dispatches while they are passing through the air, and prevent their delivery. He has a method by which he catches them on the fly, so to speak. He breaks the electrical waves that carry them, and scatters the fragments in the atmosphere. He considers this quite as important as the act of sending, at least from a military point of view. Mr. DeForest, the inventor of the American system of wireless telegraphy, says that Corbin's claim is possible, and that he can doubtless do what he proposes.

The apparatus of the DeForest system is very simple. The Marconi method is more complicated, and its messages are received in a little cylinder of iron filings. The sending apparatus of the DeForest system is an ordinary Morse key, which produces a spark and starts it on a journey over the hills and far away at the rate of 186,000 miles per second. But it does not travel in a straight line. The foot of the wave being grounded in the conducting surface, which may be either earth or water, it will follow that surface by the path of least resistance. Hence it usually passes over heavily wooded hills and mountains, following the contour of the earth, until it strikes an upright wire and agitates it with dots and dashes just like an ordinary message coming over an ordinary wire. Every time a spark is released at the sending station, a click is heard by the receiving operator's ear, and, having interpreted it in his mind, he writes it down upon a piece of paper.

An even more wonderful machine is the "radiophone"—a wireless telephone

by which Professor Alexander Graham Bell of Washington can send a song or a speech or any sound of the human voice across a country or an ocean astride one of those same electric waves. The apparatus is in operation in two forms. Spoken messages are transmitted over beams of light thrown from an electric searchlight upon a mirror at any distance you choose. The strength of the sound at the receiving end varies according to the strength of the light and the resistance. It is received through an ordinary telephone connected with a selenium cell concealed in the centre of the receiving mirror.

Another form method of sending oral messages through the air consists of two coils of wire, one of which is carried around with the operator and the other is buried somewhere in the earth.

Mr. P. B. Delaney of South Orange, N. J., has invented a machine by which any operator who understands the business can send a thousand words a thousand miles a minute, between Chicago and Philadelphia, for example, while over short distances, between Philadelphia and Washington, or Chicago and St. Louis, he says he can send 2,500 words a minute over a single wire.

The automatic telephone is one in which every subscriber has his line connected with the line of every other subscriber. Attached to his telephone box is a dial with little disks bearing numbers from one to cipher. He takes up his telephone directory, finds the number of the man he wants to talk to, and punches the little disks in the dial that bear those figures. It's a good deal like a combination on a safe. Then the bell on the telephone belonging to the man he wants to talk to rings and summons the latter to action. After the conversation is over both gentlemen hang up their receivers, the connection is broken, and somebody else can use the wire.

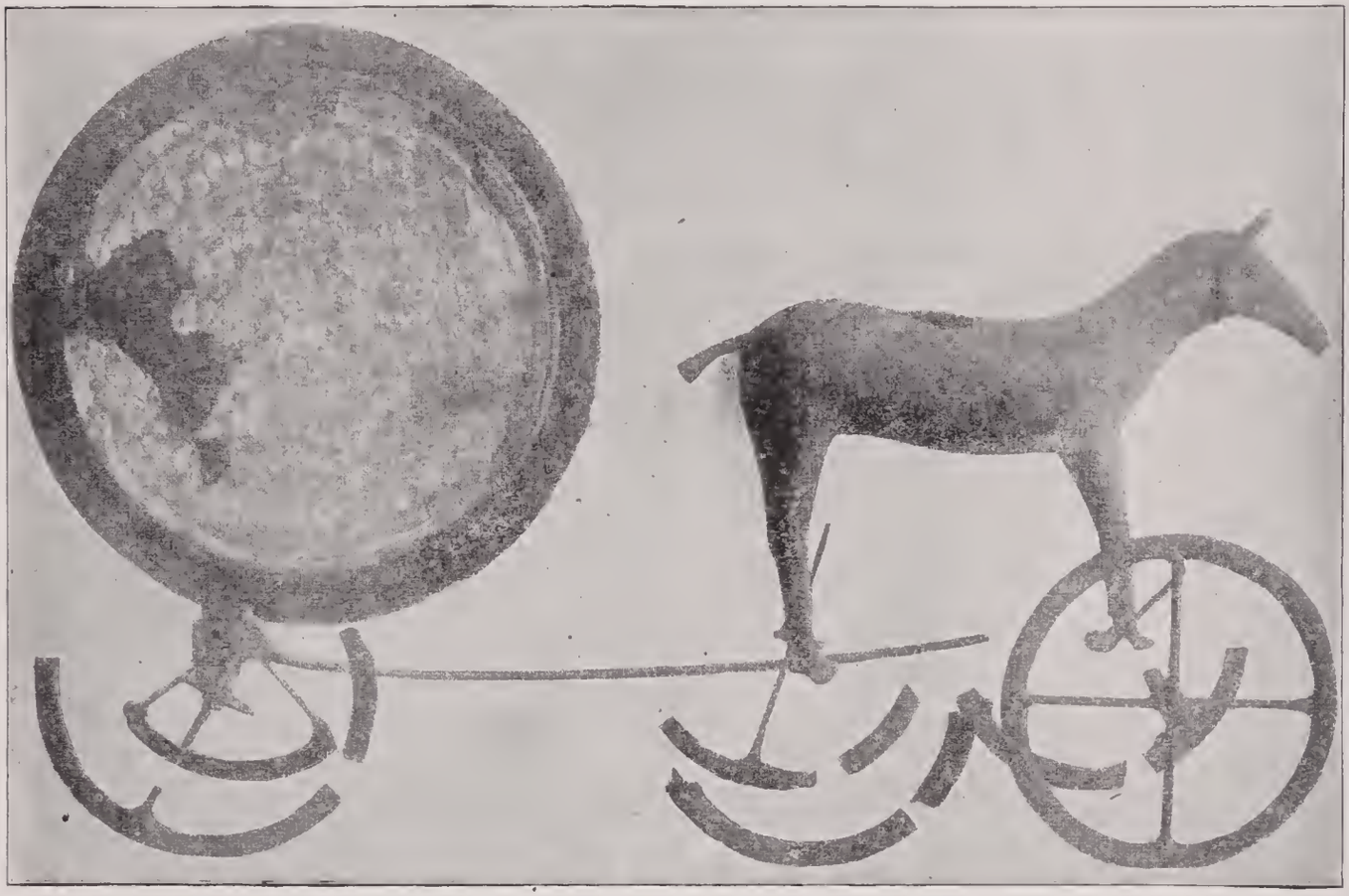
The telautograph of the late Professor Elisha Grey of Chicago has not yet become a commercial success. By this means autographs may be transmitted by wire—that is, if a gentleman sits down in his office with a stylus in his hand and writes a message upon an electric cylinder at one end of a wire, a pen at the other end will record a facsimile of the message—every letter an autocratic duplicate of the original.

A similar machine called the Poulsen telegraphone will record automatically on a moving steel wire a message sent through a telephone, and at any time afterward that message can be repeated in the voice of the sender if the wire is connected with a telephone. This invention has not yet received commercial recognition, but its inventors are very sanguine that when it is better known it will be accepted as a public necessity and "fill a long-felt want." Its chief merit is that it can record messages sent over a telephone during one's absence. The inventor, however, sees in it great utility for news service, because a single operator, at a central point like Washington, may send the same message to a dozen or forty different editorial rooms, where it may be taken off the wire afterward and recorded at leisure. He thinks it will be quite as useful in that way as the phonograph in dictating letters.

THE AURORA.

The aurora, as seen from comparatively low latitudes—such as those of the southern parts of our continent—may be roughly described as resembling daybreak in the wrong place, the southern sky being lighted up in a way which suggests the approach of sunrise; nearer to the zenith rose-colored beams are often seen, which appear to diverge from a common point in the south, but these are generally less conspicuous than the cloud-like masses nearer to the horizon. In higher latitudes the appearances are altogether different; one, two, or even more brilliant arches are seen in the sky, the space within them being very dark; outside the arches, and further from the horizon, the rose-colored beams are often present; at other times their place is taken by brilliant festoons and streamers, which by their rapid and graceful movements, make up a picture of singular beauty.

That there is a very close connection between the phenomenon of auroras and the earth's magnetism is shown by several facts. In the first place the centre of the circles of which the auroral arches form portions lies very near to the magnetic pole. Nordenskjold goes so far as to affirm that "our globe is adorned with an almost constant crown of light, nearly thirteen hundred miles in diameter, lying about one hundred and twenty miles above the ground, and having its centre



Sun image found in deep excavations at Frundholm, Denmark, showing that the ancient Scandinavians were sun worshipers.

a very little to the north of the magnetic pole." This statement, of course, is for the northern auroras, but probably the same thing holds good for those of the Antarctic regions. In lower latitudes auroras are of comparatively rare occurrence, and when seen they are always associated with large and irregular changes in the earth's magnetism. These auroral displays, like the magnetic fluctuations, belong to the class of phenomena known as disturbances, as they mark an extension of auroral activity into regions of the atmosphere generally free from it.

CAUSE OF AURORA.

The cause of the aurora is now generally believed to be a series of electrical discharges taking place in the extremely rarefied upper regions of the atmosphere. Prismatic analysis shows its light to consist of a number of differently colored lines, many of which are identical with those given out by the rarefied air contained in so-called "vacuum tubes" when electric sparks are passed through it. The peculiar feature of the light is the very low temperature of the air which emits it. It has been proved that, if the air were seriously heated by the discharge the light would be incomparably brighter than anything yet observed even in the brightest displays.

The extension of the aurora into low latitudes, and the accompanying magnetic disturbances, are known to be pretty definitely associated with changes in the sun, "solar storms," as they may be termed; whether the solar storms are the cause of the other disturbances, or only another manifestation of the action of unknown forces which affect the entire solar system, is not yet known, though the latter alternative seems to be the more probable. It is worth noting that each of these phenomena sometimes occurs alone, but this isolation is a comparatively rare event.

NITROGEN.

THE ELEMENT UPON WHICH THE SCHEME OF LIFE DEPENDS. WHAT NITROGEN IS.

Among all the elements known to chemistry there is none which confers such contradictory characters on its compounds as nitrogen. None occurs in such enormous quantities in the free state, and few need so much persuasion to make them enter into combination with other elements.

About four-fifths of all our atmosphere consists of nitrogen, and the total weight of all the nitrogen in the air is somewhere about 8,800,000,000,000,000 tons. It is a colorless, tastless, odorless gas—a quiet and inoffensive creature, to all appearances. Though it cannot support life, it yet is not poisonous. Its function seems to be simply to dilute the invigorating oxygen which constitutes the other fifth of the atmosphere.

When once it has combined with other elements all its apathy disappears, and it shows its presence in the various compounds by bestowing upon them a wonderful variety of properties, thus rendering them capable of the most diverse uses.

Foods, poisons, drugs, dyes, and explosives all bear eloquent testimony to the many-sided versatility of this strange element.

USES OF THE ELEMENT.

Every living thing in the whole range of Nature—both plant and animal—needs nitrogen for its life. Plants and animals alike consist of innumerable multitudes of cells, containing the mysterious life-jelly called protoplasm, and of this protoplasm nitrogen is an essential constituent. But, curious as it may seem, though bathed in nitrogen, neither plants nor animals can utilize it for building up their tissues. They can only use it when it has already combined with some other elements—which it is always most unwilling to do. Even the lightning's flash causes only a small quantity of nitrogen to combine with the oxygen of the air, when it is immediately dissolved by rain and absorbed by plants.

But the supply from this source would not be nearly sufficient for the vegetation of the earth, so plants draw most of their nitrogen from the decayed remains of former generations of plants and animals. Since, however, the total animal and plant life on the earth is increasing at a great rate, there would most certainly come a time when these sources of nitrogen would prove utterly inadequate—with very serious consequences for the inhabitants of the earth who are unable to use the vast supply of free nitrogen in the atmosphere.

There is, moreover, a most wonderful provision to meet this contingency. Everything seems to have been carefully arranged beforehand to secure the welfare of the living creatures of the earth. Certain plants belonging to the natural order leguminosæ (including peas, beans, lentils, clover, vetches, etc.) are subject to attack from a peculiar microbe which takes up its abode in the roots, where it causes little nodular swellings.

HOW IT CONVERTS OTHER ELEMENTS.

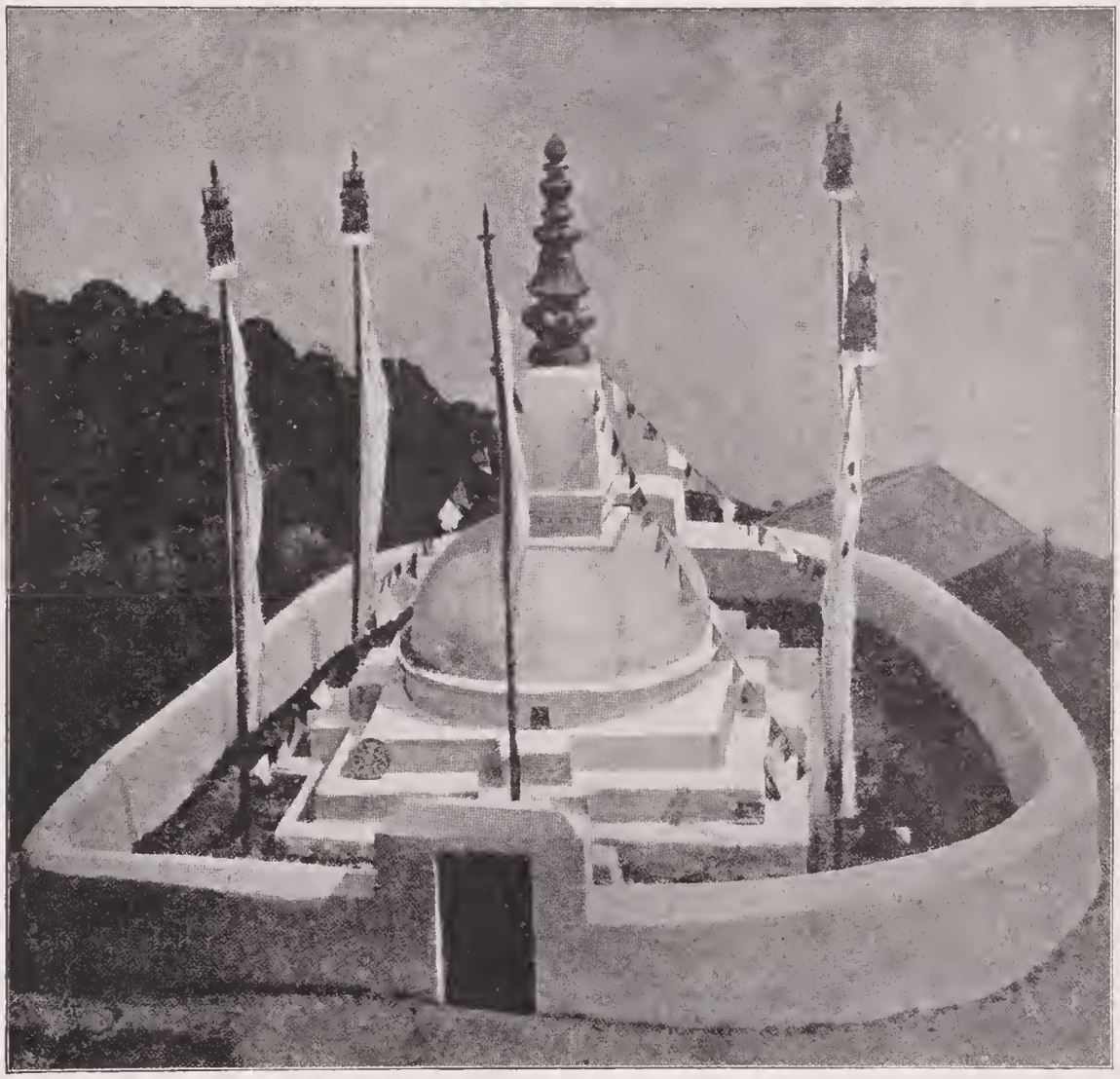
The microbe really constitutes a parasitic disease like tuberculosis in man, but with this difference—that, though the microbe feeds on the roots of the plant, it pays a fair price for its board and lodging. It actually sucks in free nitrogen from the air, and transforms it into compounds which its host can use for food. By this means enormous quantities of atmospheric nitrogen are converted into a form in which living things can utilize it.

This is why farmers find it necessary to put in a crop of beans, vetches, or clover every few years; for, since these crops derive most of their food from the air, they actually add plant-food to the ground when they die down, so that the next crop finds a richer soil than before.

It is somewhat curious that the very element which is such an absolute necessity for all forms of life should also be one of the most potent causes of death. Yet so it is. Almost all the most powerful poisons are nitrogen compounds, and seem to owe their poisonous properties to the nitrogen they contain. Such substances as prussic acid, strychnine and morphine are examples; also the deadly poisons known as ptomaines, which are substances produced by the decay of nitrogenous foods like flesh and albumen.

NITROGEN AS A COMPOUND.

This strange inconsistency is typical of the behavior of nitrogen in almost all its combinations. Its compound with oxygen forms, with water, one of the most powerful acids—nitric acid, one drop of which will burn through any animal or vegetable material; while its compound with hydrogen—ammonia—is a powerful alkali, and is capable of neutralizing any acid. Yet another compound of nitrogen and hydrogen, called hydrazine, is so powerfully corrosive that it rapidly destroys glass and almost every other kind of vessel in which it may be produced. It really seems as though nitrogen does not know its own mind for many hours together.



A Lama's grave with its protecting wall of gleaming white. From a photograph taken near Darjeeling (7,000 ft. above sea-level).

But if nitrogen supplies powerful poisons, it also furnishes us with most potent medicines and drugs—such as quinine, cinchonine, and many similar substances. Indeed, chemists have worked incessantly for many years to discover how to make

quinine artificially. So far their strenuous efforts have not been crowned with success, but they are not discouraged; and there can be no doubt that a fortune awaits anyone who succeeds in solving the problem, so great is the therapeutic value of this drug.

Without nitrogen, too, coal-tar would be unable to supply us with its wonderful collection of brilliant dyes. It was only after chemists discovered how to introduce nitrogen into these compounds —by the help of sulphuric acid—that the immense advances in the great dyeing industry have become possible.

NITROGEN GROUPS.

The basis of all those dyes is benzine, which, with many of its derivatives, occurs in coal-tar. The tar is very carefully distilled, and the various constituents separated as completely as possible. Benzine consists only of carbon and hydrogen, but is capable of assimilating a vast variety of groups of elements into its structure with the production of very diverse substances—most of them, however, being colorless, or nearly so. When nitrogen groups are introduced, very complex substances result, many of them being valuable dyes. Indeed, there are very few dyes at present in use that are not directly connected with coal-tar.

But it is in the domain of high explosives that nitrogen displays perhaps the most astonishing marks of its presence. There are some combinations into which this element seems to have a very great objection to entering, and if it is made to do so by roundabout methods, it frequently shows its disapproval by breaking up the whole structure on the slightest provocation with explosive violence. Thus nitrogen and chlorine will not combine together directly; but if so distasteful a union is forced upon them by indirect means, the result is a pale-yellow liquid—chloride of nitrogen—which is probably the most dangerous of all known explosives. One drop of this liquid explodes with fearful violence, often without any apparent cause.

We have long been familiar with nitro-glycerine and gun-cotton. These high explosives are produced by inducing nitrogen to enter into the structure of such harmless substances as glycerine and cotton. A mixture of nitric and sulphuric acids converts these substances in a few moments into these powerful agents of destruction. Dynamite is merely nitro-glycerine absorbed in a kind of fine sand called keiselguhr. This is much safer and more convenient to transport than the liquid nitro-glycerine.

Cordite consists of gun-cotton, nitro-glycerine, and vaseline. It has a stringy appearance when finished, and hence its name. Blasting gelatine is a solution of gun-cotton in nitro-glycerine. Various forms of "smokeless powder" are principally composed of gun-cotton, which leaves no residue after explosion, and gives very little visible smoke.

Even wood is now made into a high explosive resembling gun-cotton, by means of nitric and sulphuric acids, and is much used in ammunition for small arms.

AS AN EXPLOSIVE.

It is a strange incongruity that a powerful explosive should turn out to be a useful medicine. Yet such are the incon-

sistencies for which nitrogen is responsible that it has been found that nitroglycerine has a very marked influence on the heart, and is now a recognized medicine for internal administration in cases of heart disease.

A very interesting case is that of picric acid. For many years this substance has been manufactured for use as a dye. It has a brilliant yellow color, and is quite permanent on silk or wool. It is the simplest and most easily prepared of all the coal-tar dyes. Some fifteen or twenty years ago, however, a quantity of it was drying in a shed at a dye-works when a terrific explosion was heard, and the shed and its surroundings were wrecked. What had been only known as a dye suddenly made itself known as a powerful explosive. It is now in the front rank of modern explosives, and is the principal constituent of lyddite, melinite, etc. It is produced by treating carbolic acid with a mixture of nitric and sulphuric acids.

ITS EFFECTS ON PRECIOUS METALS.

Even silver, gold and mercury, which in their ordinary condition are so familiar to all, can be made into most violent explosives by associating them with nitrogen, with, however, the addition of carbon and oxygen. The substances thus produced are called fulminates. Mercury fulminate is a more dangerously violent explosive than nitro-glycerine, and cannot be used for the ordinary purposes to which high explosives are put, on account of its extreme sensitiveness to the smallest shock. It is much used in small charge for detonators.

That the violent nature of many of these substances is really due to the nitrogen they contain would appear from the fact that there is a compound of silver and nitrogen, which is highly explosive, and has often caused accidents while under investigation.

THE LATER ELEMENTS.

The new elements argon, helium, neon, krypton, and xenon, all of which, except helium, have been found in the air, resemble one another in that none of them has yet been persuaded to combine with any other element, and their general properties are very similar to those of nitrogen. These inert gases are just now attracting great interest in scientific circles, in view of the announcement made recently by Professor Ramsey and Mr. Soddy, of University College, London, that they have observed the emanation from radium to actually change into helium.

If this observation proves to be correct, the question at once arises—can the other inert gas, nitrogen included, be made from the other emanations of elements like radium? Are there other elements like radium yet undiscovered that may reveal even greater wonders to the patient student of nature? And are these inert gases merely the debris of radioactive elements, such as radium?

These speculations are intensely fascinating to the chemist, but their proof or disproof is in the future. Their time is not yet; but of one thing we may be sure. The wonders of nature are only just beginning to be unfolded by science.

FLYING BULLETS AND VISIBLE AIR-WAVES.

Photography by the brief light of an electric spark has made it possible for the man of science to detect and analyze the stages of extraordinarily rapid movements. Professor C. V. Boys has thus been enabled to photograph at various periods of its flight a rifle-bullet traveling at 1,296 feet per second, and to obtain images of its gradual progression (the term is relative) though a sheet of plate glass. But the most wonderful thing of all is the visibility to the eye of the camera of waves caused by the compression of the air set up by the flight of the bullet. These air-waves show as dark lines streaming away in parabolic curves from the projectile as it travels. Why the waves should be visible to the sensitive plate requires diagrammatic explanation, and even that is rather hard for the mind untrained in natural philosophy to follow; but Professor Boys has simplified the question by asking us to suppose that the wave is a shell of compressed air, acting as a prism. Rays striking this shell tangentially are deflected, and leave an unilluminated point on the plate. At the same time the point struck by this deflected ray is receiving another ray, which the shell has not deflected (owing to the angle of passage); consequently there is here a point of double illumination. Conceive this process multiplied for the whole extent of the imaginary shell and we get the complete dark line with a light line within it recorded on the photographic plate. Similarly, the rarefaction of the air caused by the compression sets up an image of a light line with a dark line within it. When the bullet pierces glass, each particle of shattered glass following the projectile sets up its own air wave. Another curious point is that the head and tail waves caused by the bullet are not parallel. This is due to the fact that the tail of the bullet travels quicker than the head, or to a difference in the velocity of propagation.

WHO WERE THE MOUND BUILDERS?

Persons who had their schooling fifteen or more years ago were taught that before the advent of the Indians the continent was the site of the empire of a highly civilized race quite different from the red men. The implements found in these heaps of earth, it was often said, indictated a civilization superior to that of today and quantities of eloquence was spent on the mysterious nation that had been lost from the world's history. Later investigation, however, has substituted for this romantic notion the commonplace one that the mounds were the work of Indians.

At various periods in their development certain Indian tribes seem to have been in the habit of protecting themselves by erecting extensive fortifications. Those at Fort Ancient on the Little Miami river and at Circleville, O., are especially well known. Other mounds were raised for burial places; for altars and for building sites. Some were constructed by In-

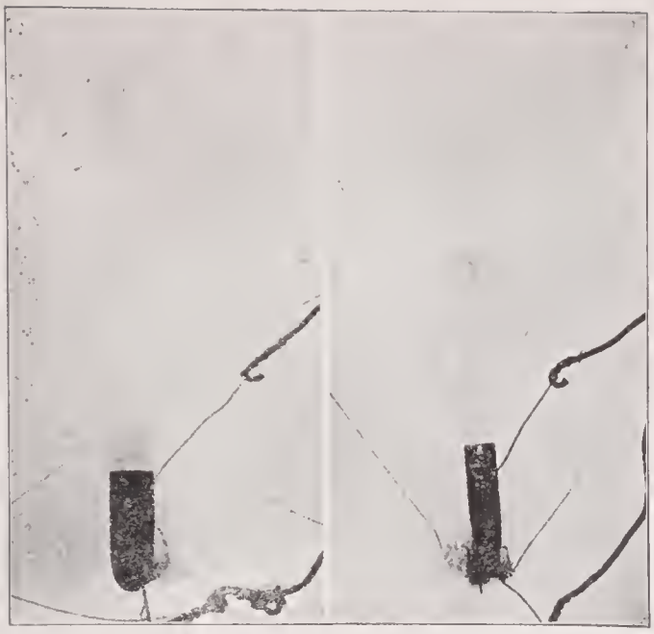


Fig. 1. Bullet traveling 1296 ft. per second.
Fig. 2. Bullet traveling 2000 ft. per second.

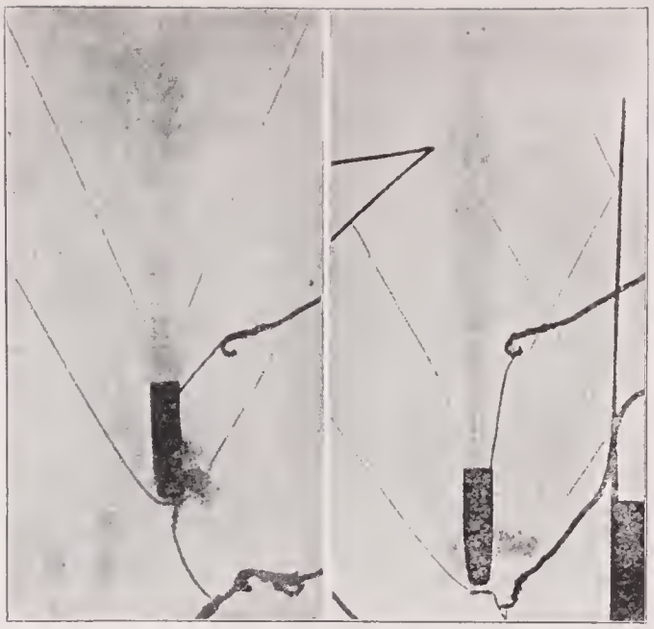


Fig. 3. Bullet passing through ether vapor and carbonic acid gas.
Fig. 4. Reflection of air waves from passing bullet.

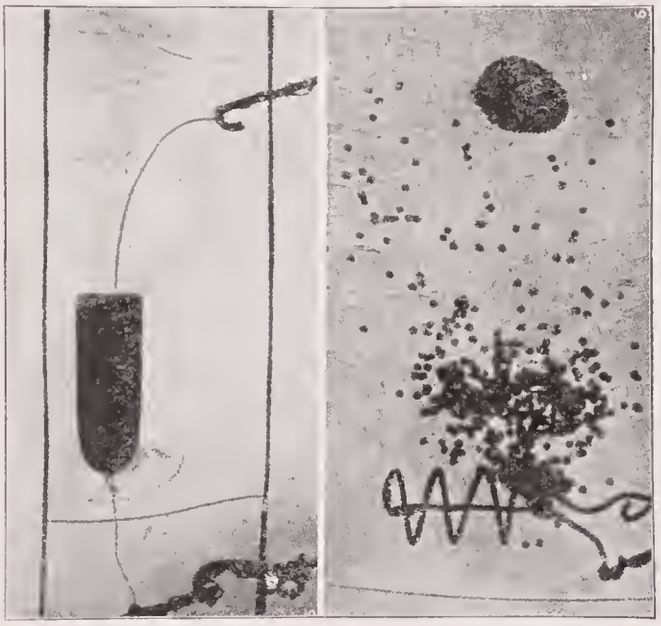


Fig. 5. Martini-Henry rifle bullet traveling 1296 ft. per second.

Fig. 6. No. 8 shot showing air waves and wad.

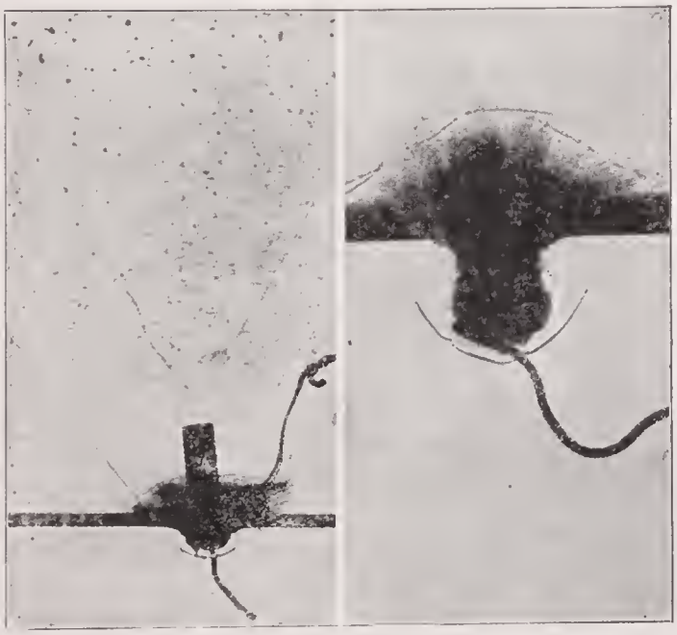


Fig. 7. Bullet striking plate glass showing back splash of glass dust.
Fig. 8. Bullet as it passes through plate glass.

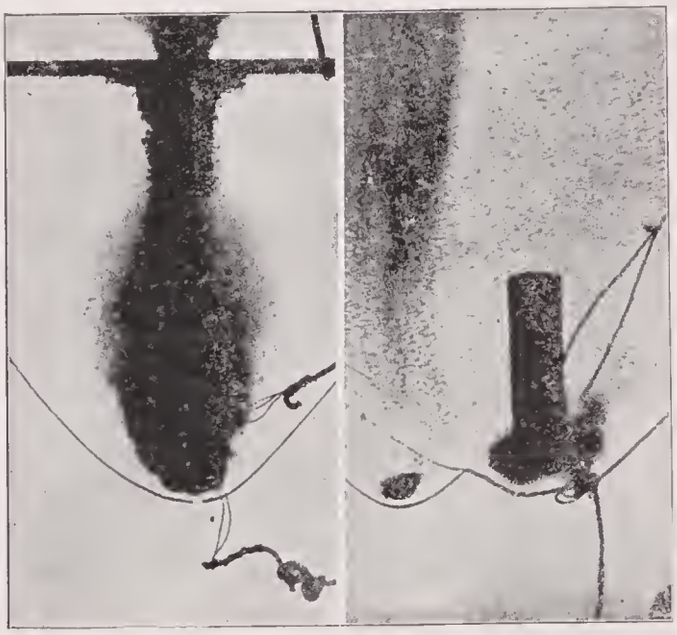


Fig. 9. Bullet after passing through plate glass showing it covered with glass dust.
Fig. 10. Bullet after passing beyond glass dust showing air waves of glass dust.

dians after the arrival of white men and contain knives and trinkets of European manufacture. Most of them, however, are more ancient, though it is generally believed now that they do not date back more than a few generations before the time of Columbus.

The contents of the mounds, including cloth, water jugs, axes, kettles, tools for spinning and various weapons, are now known to be the product of no higher culture than that of many of the Indian tribes at the time of the discovery of America. The mound-builders were about on a level with the Shawnees, Creeks, Choctaws, Cherokees and Seminoles. Some of them, indeed, were members of these tribes and when the Spaniards arrived in Florida they were still erecting mounds in the Gulf states.

The lack of records makes it difficult to follow the various Indian migrations, and ethnologists differ as to the probable location of certain tribes during the period of greatest activity in the construction of mounds. As to the main facts of what the earth heaps indicate, they are in substantial agreement and there is no longer expectation of finding the remains of a splendid prehistoric empire in America.

MYSTERY OF COMMON THINGS.

WONDERS OF COMMON SALT.

Ordinary table salt consists of two things. One is a metal called sodium. This metal is light in weight and silvery white in color. When thrown upon hot water it takes fire.

The other is a gas called chlorine. This gas is heavy, greenish-yellow in color, and has a strong, suffocating odor. It is a deadly poison.

Just think of it! When this metal and this gas are made to combine they form common salt—a necessary of life!

That same gas chlorine unites with quicksilver. What do you suppose is formed? Calomel—calomel, which can be given to babies!

These same substances, quicksilver and chlorine, if joined in another proportion, form corrosive sublimate—a deadly poison!

Can there be anything more astounding than the fact that calomel and corrosive sublimate consist of exactly the same things, only in different proportions?

There is a gas called hydrogen. It is the lightest substance known. It burns with a blue flame and a slightly explosive effect.

There is another gas called oxygen. It is sixteen times as heavy as hydrogen. It is the substance which makes everything burn.

These united give—what do you suppose? Water!

Think of that! Two gases, both of which burn, form a liquid which destroys all fire.

WONDERS OF CARBON.

Carbon is the industrial paradox. It is the hardest and one of the softest of the known substances. It burns and doesn't burn. It is colorless and transparent and black and opaque. It scintillates and sparkles, and is dull and lifeless. It is heavy as rock in one place and in another fifty pounds will fill a barrel to overflowing. It is so rare that it is called "precious" and so common that often it is a drug on the market. It is a poor conductor of electricity and one of the best. It is so expensive that a bit not much larger than a bean costs a small fortune and so cheap that the ordinary citizen buys it by the ton. It is a luxury and such a necessity that without it the industries of the country would be paralyzed.

Carbon is a paradox because as a diamond it is a precious stone, the hardest of known substances, colorless and transparent. As graphite it is black, soft, opaque and so refractory that it is made into crucibles for melting things almost heat proof. As coal it burns and is the chief source of industrial and domestic heat. As carbon black it is so "fluffy" that a boy can easily handle a barrel of it. The diamond, which is pure carbon, is a poor conductor of electricity, and graphite, which some times is 99 per cent pure carbon, and gas retort carbon—nearly pure—are such good conductors that large quantities are used in the electrical section of the industrial arts.

A diamond—pure carbon—can be placed on a block of graphite—practically pure carbon—and in the presence of intense heat can be reduced to ashes, but the graphite will show no indication of having been heat affected. A diamond is so hard it will cut glass, but graphite is so oily soft that, mixed with pipe clay, it is used almost exclusively for lead pencils which will not scratch even tissue paper.

HOW TO TEST A DIAMOND.

To test a diamond rub vigorously with a bit of silk for a moment, and the stone, if a diamond, will attract bits of wool, cotton, or paper. Expose the stone to the direct rays of the sun for a few moments and remove to a darkened room. If it is a diamond it will glow. An imitation diamond shows a number of images when one looks through it. The diamond shows but one.

METEORIC ORIGIN OF DIAMONDS.

The reasons that they are not of terrestrial origin and must have been formed under conditions never possible in the earth are these—

1. Oxygen is everywhere present.
2. Sudden cold never succeeded intense heat, as terrestrial temperature changes are slow in operation.
3. They cannot possibly be reconciled with any of the eras of geology, and have been denied a place by all geologists.
4. They are always isolated, and are never found in masses of carbon, so common in all parts of the earth.
5. They are consequently never found in a matrix when they could have been manufactured, as is the case with all other crystals.

6. They have different refractive powers in their interior and exterior layers, owing to tension during their formation, according to Sir David Brewster, and others later.

7. As conclusive, they have a different law of crystallization from carbon of known terrestrial character and formation. This fact as certainly proves them of meteoric origin as the meteoric forms of iron and other minerals tell of their celestial birth.

8. The diamonds of Kimberly are liable to crack or fly to pieces on coming into the air, and the diamonds of the meteorite in Arizona have done the same. This establishes a most remarkable relationship, and proves them all to have been subject to a pressure unknown to any terrestrial era which they have experienced.

9. A perfect diamond was never found except in a meteorite. They are all fragmentary, broken, fissured, corroded and coated with foreign material, differing in individual cases and localities.

PSYCHOLOGICAL DISCOVERIES IN VEGETABLES.

PLANTS THINK.

That plants have intelligence is maintained in a thesis by Professor Shaler, of Harvard University. He says: "Seeing that there is reason to conclude that plants are derived from the same primitive stock as animals, we are in no condition to say that intelligence can not exist among them. In fact, all that we can discern supports the view that throughout the organic realm the intelligence that finds its fullest expression in man is everywhere at work."

THE LIFE OF PLANTS.

A Belgian scientist, Professor Guarini, says that electricity is the life of plants. This electricity is supplied in the atmosphere, but sometimes the supply is not generous enough. It is a mistake to think, he says, that light alone will nourish plants. Scientists have shown these forty years that artificial light is a great stimulus to plant life, and that if electric light be applied at night in the right strength and for the right length of time the results in larger and more vigorous crops and plants will be very startling. Professor Guarini shows in a simple experiment that it is not the light alone which does the work; it is the electric radiation combined with the light, whether the electric radiation come from the sun and its rays or from the arc lamp. He surrounds a plant, for instance, with a metal cage through which the sunlight streams freely, but the cage acts as a conductor for the atmospheric electricity, and behold! the plant withers and becomes anæmic.

THE CAUSE OF RAIN.

SOURCE OF RAIN SUPPLY.

A clue to the freaks of the weather is furnished by the map of the United States showing, by differences in shading, the regions of varying rainfall for the year. The striking feature of such a map is the fairly regular arrangement of the rain belts which radiate fan-like, from

the western shore of the Gulf of Mexico. Their boundaries, however, are not straight lines, but curves, bending eastward, as if the wedges had been blown over and out of shape by a hard west wind.

Largest meteor ever found. Brought to the United States by Lieutenant Peary from the Arctic zone. From time immemorial it had been the iron mine of the natives and its place was a secret known only to the Esquimo chiefs till Peary persuaded them to sell it to him. There is a meteoric stone in South America estimated to weigh 30,000 pounds, one in Mexico even larger and Yale college has a mere fragment weighing 1,740 pounds. A meteor estimated by astronomers to be a mile in diameter passed over Europe on the night of Aug. 18, 1783, and in 1803 one of these celestial tramps burst over Normandy and scattered more than 2,000 fragments over three square leagues of ground.

The first belt, where the normal average precipitation is between fifty and sixty inches a year, begins west of the mouth of the Mississippi and embraces the gulf states. From west of this region extends another belt of between forty and fifty inches of precipitation. This bends northeast in western Arkansas, crosses the Mississippi about St. Louis, and then broadens to embrace nearly the whole Atlantic coast as far south as Savannah. Behind this lies the next belt,

which touches eastern Kansas and includes the lake region. Another narrower strip lies to the west, and includes most of Kansas, while to the west of the 100th meridian lies the great semiarid region with an average annual rainfall of from ten to twenty inches.

The inference from the map is that the gulf is the great source of the rain supply of the interior of the continent, and that the gulf and Atlantic ocean jointly furnish the precipitation for the eastern coast region.

The great atmospheric whirls, from 1,500 to 2,000 miles in diameter, which pass in procession over the continent from west to east, suck inland the vapor-laden air from the gulf and ocean. This vapor may be carried for hundreds of miles without being condensed into rain. In order that there shall be precipitation it is essential that the air containing the moisture be cooled below the dew point. Southwestern Arizona and southern California, for instance, received almost no rain, because through the season when the moist wind blows over them from the Pacific the land is warmer than the ocean and the vapor accordingly remains dissolved in the air. But the west slope of the mountains in northern California and in Oregon and Washington is deluged, because the ocean breeze cools rapidly as it strikes the crest and the moisture is released as rain.

In the interior of the continent the cooling that produces rain is usually caused by a churning of the atmosphere. As the air rises and expands it cools until it can no longer hold its moisture as vapor—just as the chill of a summer night precipitates moisture as dew. In the spring and summer of 1901 the atmosphere settled in stable equilibrium over the west. There was an almost total absence of the churning motion—the up and down drafts essential to the formation of rain. They have been full of eddies, while at the same time they have been sucking water vapor from the gulf. This has been constantly cooling from the expansion of the rising currents and so has fallen in frequent showers.

Why the atmosphere is sometimes stable and sometimes in a state of flux, science has not yet discovered. It can explain the immediate causes of drafts and rainy seasons. The more remote reasons are beyond it.

BOOK II

Triumph of Invention and Enterprise

IN THE

PROMOTION OF MAN'S DOMINION OVER LAND AND SEA

ALL THE MOST REMARKABLE ACHIEVEMENTS OF ENERGY AND GENIUS THROUGHOUT THE WORLD

The finger-mark system as used here and in Germany. The latest method of identifying criminals is by means of impressions of the under side of the finger-tip. The method which is used in this country is expected to be the identification system of the future. In the above view, which was taken at the recent Municipal Exhibition at Dresden, some typical enlargements are shown. Proceeding from left to right in the illustration they are the loop, the whirlpool, and the composite, in which the whirlpool is mixed with other forms. In the center is a chart of the human hand showing the direction of the principal lines.

Triumphs of Invention and Enterprise

GREATNESS OF GREATER NEW YORK CITY.

FIFTY years ago a transportation tunnel under New York's streets would have been considered too great a task for human achievement. A tunnel under the Hudson River would have been looked upon as impossible. Both have been accomplished. With the completion of the rapid transit subway by far the greatest work of the kind in the history of the world was done.

An underground roadway twenty-five miles in length, the greatest undertaking of its character in the history of human achievement, has been constructed throughout the entire length of the island and reaching beyond it. A tunnel under the North River from Manhattan to New Jersey has been completed. Two others are being constructed to the Jersey side and three are being built under the East River, connecting Manhattan with Long Island.

The Pennsylvania Railroad tunnel, now well under way, will open a through roadway under the rivers and the city from New Jersey to Long Island City, with the largest railroad station in the world in the centre of Manhattan. Three new bridges, all of which are to be larger than the old Brooklyn Bridge, are soon to span the East River, and all this is but the beginning in the gigantic scheme of rapid transit projected for New York. The sum of $320,000,000 is now invested in the construction of tunnels and bridges in and adjacent to Manhattan Island. In the history of civilization no half century has ever witnessed such a degree of material progress as has marked the upbuilding of New York City.

Within the last decade building operations in Manhattan have employed more than $100,000,000 annually, and with the prospect of improved transportation facilities new business and residence centres have come into existence.

CARRYING CAPACITY OF THE BRIDGES.

On November 10, 1903, by actual count, 330,300 persons crossed the Brooklyn Bridge. It is estimated that the increase in traffic since then has brought the daily average up to 350,000. Taking these figures as a basis, those who are familiar with the capacity of the other East River bridges have prepared this table:

Name of Bridge.	Capacity.
Brooklyn Bridge	350,000
Manhattan Bridge	650,000
Williamsburg Bridge	500,000
Blackwell's Island Bridge....	350,000
Randall's Island Bridge.....	150,000
Total	2,000,000

All of the bridges to span the East River, with the exception of the pro-

posed Randall's Island Bridge, will be larger and have a greater carrying capacity than the old Brooklyn Bridge. The old bridge has four car tracks, all told, two for trains and two for surface cars, with two roadways and one promenade. As compared with this, the Manhattan Bridge, which is to run from Canal street and the Bowery to Nassau street in Brooklyn, will have four elevated or train tracks, four surface car tracks, one roadway and two broad sidewalks.

THE GREAT SUBWAY TUNNEL UNDER NEW YORK CITY.

The work covers a distance of twenty-four miles—thirteen and one-half miles of subway proper, five and one-half miles of elevated viaducts and five miles of deep tunnels. The main stretch of track from city hall to One Hundred and Fourth street is 6.7 miles long and four-track all the way. Following onto this are a three-track system of 7.4 miles and a double track system of 9.6 miles, making a total length of twenty-four miles. The entire track length is seventy miles. The portion of the subway opened to the public for traffic consists of the four-track route as far north as West Ninety-sixth street.

Unlike a number of other great works, called "subways," the greater portion of this New York system is in reality a subway, having been built by the "cut-and-cover" method—the entire street being opened up and dug, and blasted down to the required depth, and afterwards covered over with heavy steel floor, forming the bottom of the roadway above.

The engineering problems overcome in the construction of this subway were stupendous. By far the greatest of them was the building of the tunnel under the Harlem River, without resorting to compressed air, but by the entirely novel method of clamping tubes and sinking them to the required depth until they connected with the subway excavations, on dry land. Sections of the subway were built in the form of tubes, which were closed at each end with water-tight covers. These were inclosed in a rectangular structure of iron and concrete, sunk to the river bottom and bolted to the advancing tunnel.

In certain parts of the route actual mining operations had to be carried on. At the highest parts of the hill, uptown, which reaches from One Hundred and Fifty-seventh street to Fort George, the tunnel is 200 feet below the surface, and half a dozen shafts were sunk in different parts of the rocky mass in order to facilitate the work below. A shaft was sunk at One Hundred and Sixty-seventh street and another at One Hundred and Eighty-first street, and from the bottom of each of them tunneling went on in both directions until the workmen joined one another by breaking through the rock between.

In many localities where it was found impossible, on account of the enormous amount of traffic—such as on lower Broadway—to use the cut and cover system in building the subway, the subcontractors were ordered to have their men dig in underneath, like moles, and this was done without a single accident. For seven months lower Broadway was walked over by millions of people, not one of whom ever had an inkling that

almost immediately beneath his feet stretched a great hole, thirty feet deep.

The largest power-house in the world has been erected to supply the motive power for the new system. The building stands between Fifty-eighth and Fifty-ninth streets and Eleventh and Twelfth avenues, and is, in itself, a stupendous work not by any means overshadowed even by the subway. The machinery consists of eleven engines, each of 12,000 horsepower, and seventy-two boilers of 600 horsepower each.

For the purpose of sustaining the weight of this great building and its enormous plant in safety, the foundation was carried down to bedrock. From this building thousands of wires and cables reach to the various distributing plants along the route of the underground road.

"Having shoveled and blasted this four-track highway, fifty-four feet wide, under the most crowded parts of New York, with the foundations of tall buildings on either side of us, and tangled miles of water mains, sewers, steam pipes, gas pipes, and all kinds of electric cables and conduits in our way—not to speak of the enormous traffic moving in the streets above us—we have demonstrated that the rapid transit problem of any great city can be completely solved. It is now simply a question of more tunnels. As far as New York is concerned, there is not a street in the city which cannot be safely tunneled.

GREATEST TUNNELS IN THE WORLD.

	Miles.
New York Rapid Transit	22 4-5
Metropolitan Underground, London	13
Simplon, Switzerland	12
St. Gothard, Switzerland	9¼
Paris Underground	8½
Mont Cenis, Switzerland	7½
Baltimore and Ohio Railroad	7
Arlburg, Austria	6
Tuppenny Tube, London	5¾
Hoosac, Massachusetts	4¾
Berlin Underground	4½
Liverpool and Birkenhead	4½
Boston Subway	2½
Cascade, Great Northern Railroad	2½
Budapest, Austria	2
Bowlder, Montana	2
Ivanhoe, Colorado	2
Sarnia, Canada	1

THE PANAMA CANAL.

The isthmus connecting the two Americas, is to be cut through by a ship canal 49 miles long. Few enterprises in the world have been the result of more scandals, intrigues and financial loss. The idea of this canal began in the time of Spanish conquests, but only in recent years has it been the occasion of so much trouble.

In 1875, a commission surveyed the route and recommended a canal at a cost of about $95,000,000. In 1879 an International Congress met in Paris and recommended a canal to be completed in twelve years at an estimated cost of $240,000,000. De Lesseps, who had made the Suez Canal, was nominally in charge, but he was old and the actual work devolved upon others. Enormous efforts appeared to be in operation for ten years when a receiver was appointed. It was then found that $246,000,000 had been used

to no special progress in the great enterprise. In 1894 a new company was formed and an International Technical Commission of Engineers examined the difficulties and reported that the canal could be completed for an additional $102,400,000. This company did some work but was unable to obtain the necessary funds. Their franchise from the Colombian government being about to expire, they sought to sell their interests to the United States. This was finally done for $40,000,000. The Commission appointed by the United States estimated that it would cost $144,233,358, including the necessary rebuilding of the Panama railroad for 15.5 miles, the railroad being included in the canal purchase.

The United States Treasurer signing the $40,000,000 Panama check. The $40,000,000 warrant which was signed by Mr. Shaw, secretary of the United States Treasury, on May 7, for delivery to the disbursement agents for the Panama Canal purchase, was the biggest warrant ever issued by the United States Government. On May 3 all the necessary documents were signed at Paris and at Washington and the Panama Canal Company delivered all its documents to the United States. The treaty by which the whole arrangements were made was signed at Panama on December 2, and the signing of the warrant brought the most important negotiations undertaken by the Roosevelt administration to a most successful issue. The canal was originally begun by M. de Lesseps in 1881. In 1893 he and some of his family were prosecuted for bribery. In 1902 the Panama Canal Bill was signed by President Roosevelt, by which the property of the Panama Canal Company was to be purchased for $40,000,000. In November last year Panama was formally recognized as a republic by the United States. The purchase ends a long-disputed enterprise which may revolutionize commerce.

UNDER THE SEA.

TERRORS OF WARFARE UNDER THE OCEAN.

The great nations of the world who build big battle-ships and magnificent cruisers to fight each other will henceforth have to calculate upon a comparatively new and terrible weapon of warfare—the submarine.

Within range of this unseen monster, creeping along with only its cobra head

above water, battle-ships will become as air bubbles and cruisers as brittle glass. Iron decks will become a terror and the glimmering sea a nightmare. The roll and tumble of every wave, the flash of swimming seabirds, to the distorted imagination of the sailor will take on the appearance of the dreaded periscope —the projecting eye of the deadly submarine.

Never before in the annals of all the navies of the world have such wonderful things been performed. With these vessels, an utter mockery is made of the finest armor-clads afloat. By them it is demonstrated that the naval war of the future will be a thing almost too brutal and bloody for conception. Such a thing as army transport ships will become an impossibility, however closely they may be guarded.

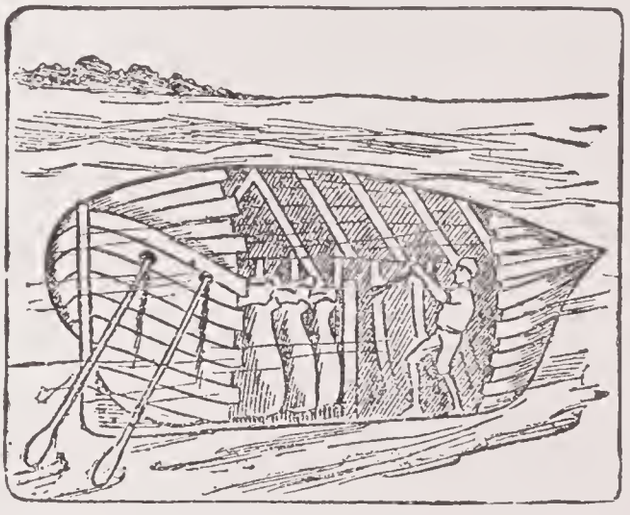
Yet, after all, through its mere capacity for destruction the submarine may make for peace. With a hundred torpedo-boats such as of recent construction included in the navies of the greater nations of the world, the international rules of warfare will have to be revamped to reconcile the strange extremes of civilization and brutality.

THE BATTLE-SHIP OUT OF DATE.

In the opinion of many able and experienced officers the coming decade will see hundreds of mighty battle-ships relegated to the naval junk yards. Their belief in the submarine is positive and dogmatic. They believe it to be not merely a moral menace threatening to unnerve the crews of big ships in war, but a material menace of grave import as well.

"Will it pay us to build any more battle-ships?" was asked of one of the government naval experts. "Would not army transports be better guarded by a number of vessels carrying submarines on their decks, and having launching devices on board?"

"Why, one of these boats could make a scrap-heap out of the biggest battle-ship afloat," he replied. "Battle-ships cost millions. These liliputian things cost only thousands. The so-called supremacy of the sea is now a fiction. Every country having a seacoast will in the future



Old wood cut of the first known submarine boat.

guard it by submarines, and no enemy will be safe from them fifty miles from shore."

At Newport one of the officers of the submarine boat Porpoise stated that one night he took his vessel out to the Brenton's Reef lightship, on the understanding that the forts Wetherell and Adams were to endeavor to pick him up as he passed into the harbor.

As is well known, the harbor mouth is not over a furlong in breadth, and the big searchlights on the forts make it as light as day.

The Porpoise, submerged, ran into the

harbor, past the forts, past the searchlights on the torpedo station, and anchored at Rose Island, three miles up the bay, where she lay until morning without discovery.

An additional improvement is being fitted to the government submarine boats which may prove extremely useful in case of sinking through shot or collision.

It consists of a sort of trap-door under the torpedo tube in the bow. There is an airtight chamber connecting with the trap-door which when filled with compressed air permits the door to be opened. Divers in costume can then walk out on the ocean floor. In emergency the crew could come to the surface with rubber air floats.

UNGROUNDED FEARS.

The interior of a submarine under water is not at all an uncomfortable place. There is plenty of room. It is brilliantly lit up, and the ventilation is excellent.

A popular mistake is that a submarine is always in great danger of hitting the bottom, especially if the water be shallow, and so knocking a hole in herself. But it does not hurt a submarine to strike the bottom at all. She differs totally from surface vessels in that she sinks upward, and not downward. The surface vessel strikes the bottom with all her weight, and, of course, if her buoyancy is destroyed, down she goes. The submarine, on the contrary, is wrong side up, as regards boats of the ordinary type. She always wants to go up in the water, just as balloons want to go up in the air, and she will go up automatically if her diving rudders or propelling gear get out of order.

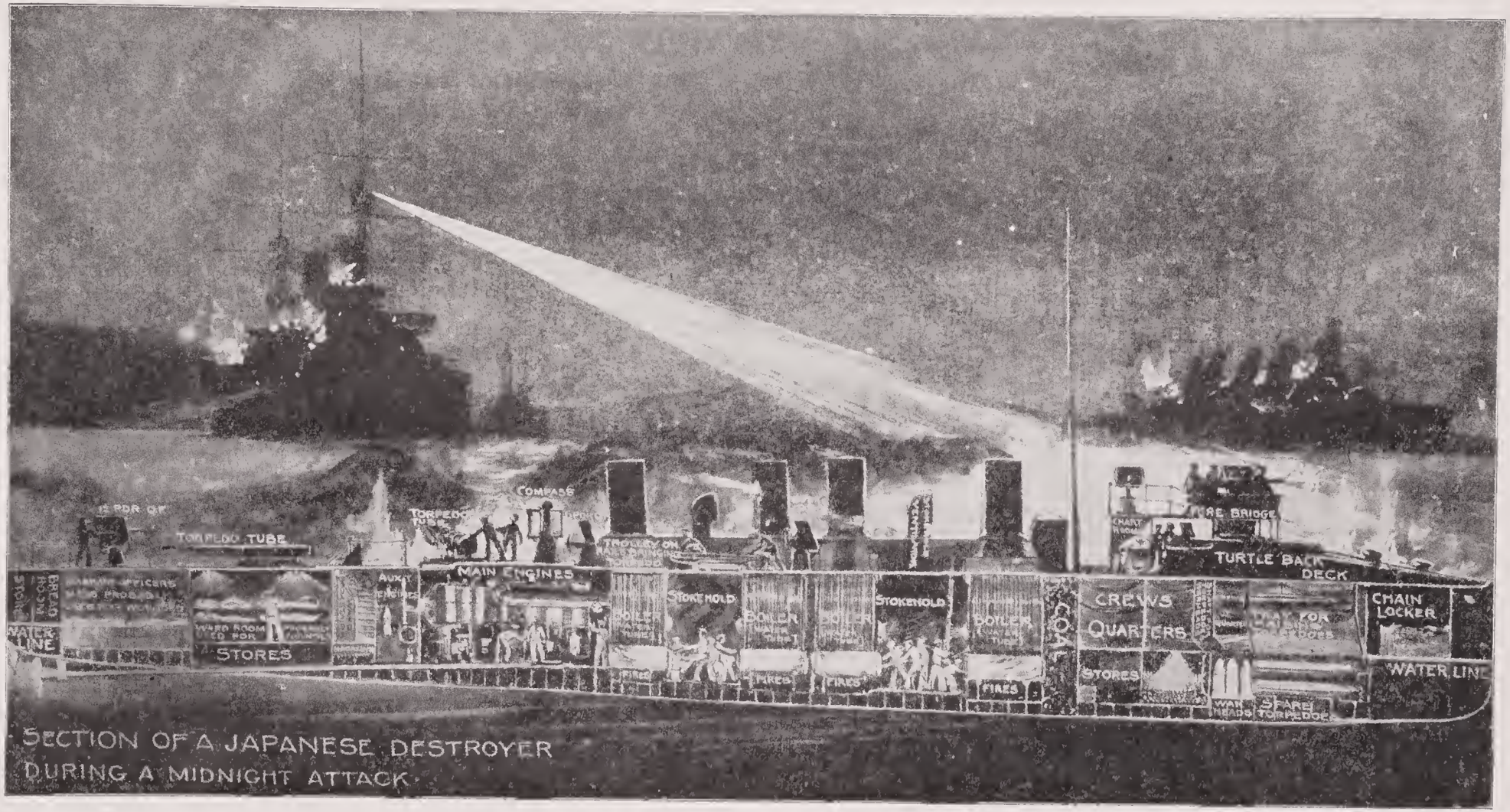
In fact, you have got to make her go down, and as her desire to go up and her desire to go down are almost equally balanced she touches bottom about as gently as a feather. Even if she scrapes along over sharp rocks and gets hurt underneath it does not do any harm. She is all steel tanks on the under side and they are filled with water when she is submerged. So that if her skin on the outer bottom be injured the tanks themselves furnish another bottom which is perfectly tight.

DIFFICULT RIDING.

In a heavy sea a surface torpedo-boat is fairly safe, but being very light her motion is terrific and life in her is misery, and, besides, one of constant danger, for the violent jerks and leaps tend to throw people headlong from the deck into the water, and, indeed, often have done so.

It takes skill very much like that of a circus rider to stand up on a torpedo-boat's deck in a moderate sea. The submerged boat, on the other hand, does not jump around. She acts like a great water-soaked log. She merely toboggans down the long waves with an easy swing which is not at all unpleasant. If the waves become combers, so that they break heavily on her, she dives, and at 20 feet or so below the surface always finds calm water and stays there placidly until the storm raging overhead is over.

As for effectiveness, a submarine boat can come to the surface, take aim, dive and fire her torpedo in from 10 to 15 seconds, and with a well-drilled crew she ought to hit a battle-ship from four to five hundred yards distant eight times out of ten.



Section of a Japanese torpedo-boat destroyer during a night attack on warships. The T. B. D. is a torpedo-boat of a very high speed, which came into existence in 1893. The average boat used by the Japanese has a displacement of 350 tons. They are about 215 feet long, and their beam is 21 feet. The thickness of their plates varies from five-sixteenths of an inch to three-sixteenths. The average speed is 31 knots an hour. The crew number 60, including officers and men.

DANGERS TO CREW IN TORPEDO-BOATS.

All torpedo-boat work is dangerous; in action, desperately dangerous, and this whether the boat be run on the surface of the water or under it. This is because a torpedo-boat is not intended to act as a dispatch vessel, scout, blockader or the like, but solely to carry a self-propelling torpedo to a place sufficiently near to the vessel to be blown up so that when the torpedo is let go it will be exhausted.

This distance is now a maximum of about one mile. But any run to the vessel before its propelling force is placed in the neighborhood of a war vessel from which such a torpedo can with certainty be projected is a very unsafe place. No surface torpedo-boat ever goes there in the daytime.

She always picks out a moonless night, and especially when there is a low-lying mist on the water. Sometimes she manages to get there without being seen. Sometimes she does not, and has to make a rush for it. But no matter how she arrives, or how dark the night, that place is very apt to be brilliantly lit up by searchlights, and also subject to sudden and violent hails of steel shells.

Now, a surface boat cannot make herself invisible, and a chance glint of a searchlight on the foam in front of her bow will reveal her to her ever-watchful antagonist long before she has got within a mile distance of her target. Then the steel hail goes out to meet her.

When the Terror tried to sink the St. Paul during the Spanish war she was discovered when only a speck in the distance, and the guns tore her to pieces when she was more than three miles off.

FRAILTY OF THE VESSEL.

A surface boat is nothing but a thin shell of steel packed full of the complicated machinery necessary to drive her at express-train speed, and, therefore, is perfectly defenseless even against one-pounder or three-pounder shells. A single hit in her boiler or engines may convert her into a helpless wreck which her antagonist can shatter at his leisure.

The submarine torpedo-boat has exactly the same function as the surface boat, but, as she goes under water, she is not limited to work at night for her own safety. On the contrary, she can make her attack in the brightest daylight, and she relies upon the water above her not merely for purposes of concealment, but as the most effective of all shields against gunfire. The searchlight has no terror for her. There is no steel hail in the place from which she sends her torpedo.

There is a prevailing idea that the submarine boat stays under water all the time. Ordinarily, she runs about on the surface like any other boat, and is propelled by a gasoline engine, like an automobile. It is only when she wants to hide herself, or when she desires to attack, that she goes down.

Even when she is approaching her prey she runs on the surface, with her conning-tower a few inches above the water and looking very much like an ordinary floating barrel. Just as soon as she gets within dangerous distance of the attacked vessel down she goes, and, having already noted the direction of her target, she steers toward it by compass, just the same as any vessel steers in the dark or fog. As soon as she has got near enough she slips her torpedo and runs

away. If she happens to be very near to the surface, and the sea is smooth, an observer high up on the deck of the attacked vessel might possibly see some indications of her, very much as one can occasionally get a glimpse of a porpoise from the deck of an ocean steamer. But the discovery is of no good.

Even if there were time to fire many projectiles at her, they would simply bound from the water like skipping stones.

In brief, there is no possible defense except flight, and that means constant motion of the vessel endangered at a speed much faster than the submarine can go; and even then the submarine may lay her course to intercept that of her enemy, and so send a torpedo straight to its mark.

PERILS OF THE SUBMARINE.

There is a general notion that service on a submarine boat is much more perilous to the crew than on a surface boat, and this idea has lately been strengthened by the recent destruction of an English submarine, with all on board, by being run down by an ocean steamer. Of course, it is true that a submerged submarine is helpless against collisions of any kind. She cannot see other submarines in her vicinity, nor vessels on the surface, nor can they see her; but that is a chance which must be taken, and which, as a matter of fact, is really remote. In waterways where vessels are known to be constantly plying a submarine, except just when diving or ascending, has no business to be moving about at depths where she can be struck. She ought either to be on the surface, where she can see about her, or else so far down that ships will certainly pass over her.

She can navigate at depths of from 30 to 40 feet just as well as in shallower water. Then she is perfectly safe from collision even with the largest steamers. In fact, that is quite a good position for her, because she can get some knowledge of the proximity of other vessels through their cutting off her light as they pass over her, and also by hearing their engines. But people will always associate going under water with the notion of drowning.

A FEARFUL PRISON.

Of course, the idea of being locked up in a tank 40 feet under water for long periods of time, in company with 600 or 700 pounds of explosive gun-cotton, does not seem to be the safest situation in the world. But there is no more necessary connection between drowning in a submerged submarine than drowning in the submerged portion of a hull of a great steamer.

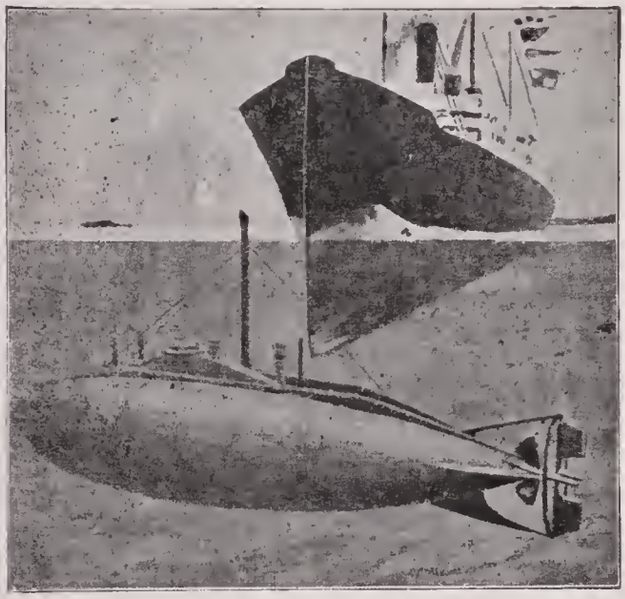
One is just as much under water as the other. If the submerged boat is tightly shut up so that air and light must be artificially supplied to her crew, the same is exactly true of the fire-room of a steamer when forced draught is used and electric lights installed. In the closed fire-room or closed boat the ventilation and lighting are as artificial in the one case as in the other.

The air in the fire-room is forced in from the atmosphere, while the air in the boat comes from her reservoirs of compressed air; and of the latter she carries a supply abundant to last her crew for several days.

When the interior of a submarine under

water is full of water the boat still has plenty of buoyancy to bring her to the surface.

A hole punched in her top or side is bad, but that can hardly happen except through collision, and it is her business to keep out of the way of collisions in the manner already pointed out, and, besides, a hole below the water line in any vessel is a troublesome matter.



Terrors of the Submarine. This shows how the English submarine "A1" was run down and destroyed by an ocean liner. The captain reported that his ship had struck some unknown object during a fog, but it was several days before it was known that the object struck was one of the principal submarine vessels in the English navy.

When submarines were first proposed it was quite confidently predicted that, being cigar-shaped, they would have no hold on the water and so in a heavy sea be rolled over and over like a barrel. Some of the earlier French submarines built on a bad system of balancing did occasionally stand on their ends and so drop their crews into their machinery. But modern boats have no such defect as this, for their balance is accurately provided to cover every emergency.

The men in our navy have fully got over any apprehension of being drowned in submarine torpedo-boats. In fact, one of these boats is now kept at the Naval Academy and the young midshipmen are constantly sent out in her to Chesapeake bay and have become quite skillful in her management.

EARLIEST ATTEMPTS AT SUBMARINE VESSELS.

It seems rather an absurd thing, said a naval captain, that, although a submarine boat was tried on the Thames nearly three centuries ago, we still have not evolved anything like a perfect underwater vessel. Of course, this submarine of the time of the Stuarts was a very primitive kind of craft. It was propelled by oars and, I believe, was much more adept at sinking than at coming to the surface again.

Forty years ago the Confederates of Charleston used a submarine boat to some purpose against a Federal ship. She was a clumsy, cigar-shaped boat, roughly constructed from boiler-plates, and was propelled by hand at a maximum speed of five miles an hour. On her first three trial trips she sank beautifully enough each time, but she wasn't equal to the task of rising again unaided, and every man on board of her lost his life. The fourth time she was sent out she did better, for she managed to blow up the Housatonic. She was too slow, however, in getting away after delivering her blow, and she was carried to the bottom of the sea for the last time in her victim's company.

So, you see, the submarine of 1863 was no great advance on that of the Stu-

art days, and it was not until Nordenfelt set to work about twenty years ago that any real progress was made.

HOW IT FEELS TO GO DOWN IN A SUBMARINE BOAT.

An engineer has described his experience in submarine crafts as follows:

"One's first sensations when going down in a submarine are almost indescribable. There is a feeling of suffocation that almost overcomes one. The gasoline fumes have to be fought against, and until they are overcome one is dazed and only half conscious of what is going on.

"Perhaps I cannot describe the feeling better than by saying that it gives you the impression that you are sinking into your grave. You get impressed with the maddening idea that the boat will not rise again, and it needs a strong man to combat such a sensation as this and overcome it. It is not until you have made many descents that you are able to go down without experiencing these qualms.

"As soon as the boat begins to dive, imagine being inclosed in a big steel shell so tightly battened down that escape is impossible no matter what goes wrong, half smothered by the oppressive, fume-laden atmosphere, yet thoroughly conscious that the slightest mishap will be fatal to the fragile craft you are helping to navigate, and you will have some sort of idea what going down in a submarine is like. No one who has not actually experienced it can fully realize the sensation.

"Those who would not feel the slightest fear of being battened down in a submerged torpedo flat or an engine-room, or of being locked up in a casemate in the hottest action imaginable, will yet funk the nerve-trying experience of diving in a submarine.

"In a big ship, no matter whether you are above the armored deck or below it, you feel you have some sort of a chance. But in a submarine you know you have none, and no matter how stout-hearted you may be this knowledge must have its effect, so that few are willing to continue the experience."

THE PERISCOPE FOR SUBMARINES.

The periscope is one of the most interesting and most remarkable inventions of the age. It is a glass tube about three inches in diameter and when those under water wish to know where they are they poke it up through a circular opening in the roof of the boat. There is formed for those below a perfect picture of the condition of the surface of the water with every object upon it in just as fine detail as the naked eye could observe it.

The periscope, which is a series of lenses and prisms, is so long that even though it is projecting above the surface of the water sufficient to take in the surroundings the deck of the submarine is still twelve feet beneath the water.

As the periscope is of glass it is not easily seen so near is it to the natural color of the water, but sometimes the practiced eye may detect it and so it is liable to be destroyed by a well-placed shot. Then those on the submarine would have to observe by coming up till their conning tower was out of water and they could note the surroundings through the small port holes.

SUBMARINE TORPEDOES IN WAR.

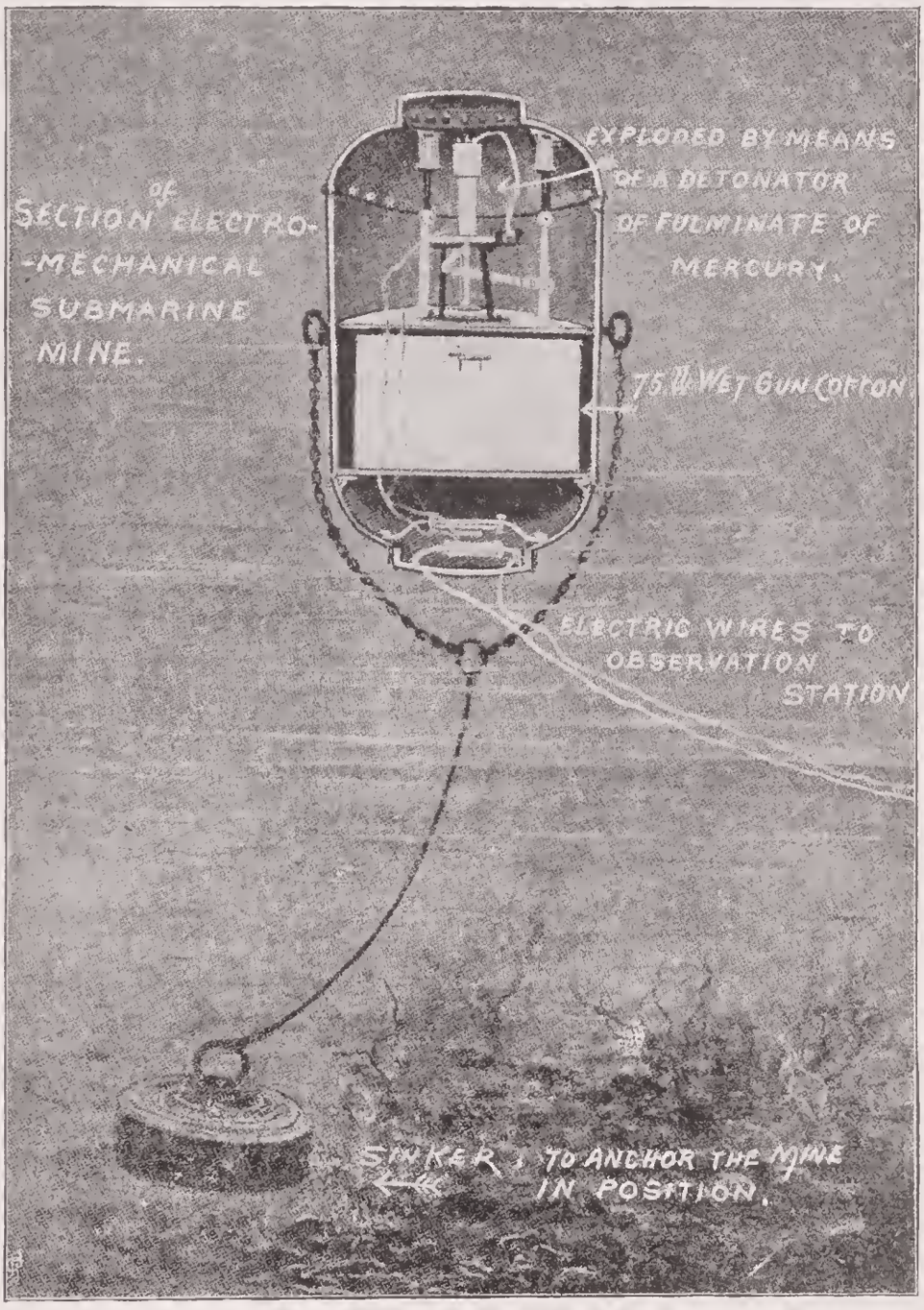
The Whitehead torpedo employed in our service, except on board the Iowa, where the Howell is installed, is technically known as an "automobile" weapon, in contradistinction to the "dirigible" type, which is electrically directed by means of wires from an operating base. The form of this complex instrument varies, but popularly speaking it is a cigar-shaped vessel separated into various compartments. Counting from the bow these isolated spaces are assigned (1) to the war head, (2) to the air flask, (3) to the immersion or diving chamber, (4) to the engine room, (5) to the after body, and (6) to the tail.

Extending beyond the war head, which contains the gun-cotton charge and the percussion igniter and its charge, is a screw fan free to revolve. After the torpedo has run a distance of about eighty yards this fan unscrews sufficiently to put in operation a percussion firing apparatus. Should the fan strike an unyielding substance it and the spindle on which it revolves and the firing pin are driven against a fulminate of mercury percussion cap. This impact detonates the dry gun-cotton firing charge, and the latter ignites the wet gun-cotton contained in the war head. The air flask, occupying nearly two-thirds the entire length of the weapon, holds the compressed air used for driving the machinery. This air flask, it may be said in passing, can be recharged whenever the occasion demands by pumps that produce an exceedingly high pressure. Located in the immersion chamber is the delicate apparatus that carries and keeps the torpedo at the depth of water predetermined for its immersed travel. The flight of the weapon is directed by two rudders—one a compound horizontal which controls the depth of immersion, and the other a compound vertical, which shapes the course. The former, located in the immersion chamber, maintains the prescribed depth through the action of a hydrostatic piston. The face of the piston is exposed to the water, and when the torpedo goes below the fixed depth this piston is pushed in by the increased water pressure. The rudders are turned at a lifting angle and the torpedo rises until the desired level is reached. Should the torpedo be above the depth set a reversed action takes place. In addition to this gear a pendulum, also connected with the horizontal rudder, is employed to prevent it giving too rank a sheer to the weapon.

THE CONTROLLING MACHINERY.

The compressed air passes from the flask into the engine room through a pipe governed by several valves and works under normal conditions an engine that is exceedingly light in construction and very accurate in adjustment and operation. The after body, shut off from the engine room by a steel bulkhead, provides the necessary flotation for the weapon, and in the torpedo tail are carried the rods that control the rudders and the shafts that drive the screws. Other devices are employed, most notable among them being the Obry gear, or gyroscope, which automatically controls the vertical rudder. This compels the torpedo, no matter what deflection is encountered

when it enters the water, to return to the original line on which the destroyer's tube was pointed when the firing key was first pressed. "The immense simplification of aiming that has resulted from the adoption of this device," writes Lieutenant Chandler, "must be apparent, and the gyroscope has made out of the torpedo a weapon that within its range is far more accurate than the gun." "There is do doubt in the minds of officers," declares Commander Murdock, "that a torpedo exploded alongside or under a vessel will cripple if it does not destroy her. Argument must therefore focus on the single question, Can a torpedo be made



Mechanism of the deadly submarine mine. The largest warship is at once sunk by contact with this powerful explosive.

to hit? Or, in one word, on its reliability. Nothing in the world can determine this but actual trial. And it is noticeable that all officers who have had extended torpedo boat service agree with Lieutenant Chandler that the torpedo ranks with the gun in reliability. One expert puts it that the torpedo excels the gun in accuracy, from the fact that its errors are all in training, the serious question of elevation being eliminated."

INGENIOUS DEVICES.

Many improvements have been made in the torpedo and in its launching apparatus within the last few years, though the secret of these is jealously guarded. Among the most ingenious is one that enables the commanding officer of a vessel carrying torpedoes to point his ship at the spot he desires to hit and then by an electric firing gear to discharge the torpedoes from all the tubes simultaneously and in such a way that they will, after striking the water, turn and run parallel to the course of the ship. With a three-tube boat, like the Morris, for example, he could thus discharge three torpedoes, running into a danger zone about one hundred yards wide, one on each side of the zone and the third down the middle of it. The possibilities of a hit under such circumstances are enormous. Among other devices undergoing trial is one that superheats the compressed air before it enters the engine. This raising of temperature is most necessary, because when the compressed air is free it expands, producing a low temperature that reduces its energy. An illustration of this is found in ice machines and in the apparatus used for producing liquid air. Another device simplifies and renders more certain the operation of the Obry gear by means of electrical connections, and a third substitutes turbine machinery for the present reciprocating engines. A well-known expert sees in this substitution a jump in speed to at least forty knots for the eight-hundred-yard run and a correspondingly great increase of range at slower speed.

WIRELESS TELEGRAPHY.

ITS UTILITY DEMONSTRATED IN MANY FIELDS.

The Oriental war has established the utility of wireless telegraphy as a valuable means of maintaining communication during times when other methods of conveying intelligence between a belligerent and its base may be severed. The naval squadrons of both nations have found it invaluable in their operations. The scouts of the Japanese fleets have been able to inform their flagships of the movements and position of the Russian ships which they were detailed to locate, at distances far too remote for the employment of ordinary signals used at sea. The fleets of both belligerents have also used it in action to direct the maneuvering of the various vessels engaged. Port Arthur was also able to keep in touch with Chefoo after the telegraph land lines and the cable were cut by the Japanese, until the equipment at the Chinese port was recently dismantled by the authorities on the Japanese representations that it was being used by the Rus-

sians as a military base in violation of the laws of neutrality.

The Russians demonstrated, however, in their sorties made by the Port Arthur squadron, that it was possible to confuse the Japanese messages and thus hamper the movements of their ships by the simple expedient of continuously repeating the Russian alphabet on their own instruments. The United States Navy has forestalled such a possibility by adopting a system which can be variously attuned at pleasure and thus prevent interference by the enemy.

Wireless telegraphy has been found exceedingly useful also in the navigation of the oceans by the big liners. The monotony of the passage across the Atlantic has been largely destroyed by its employment. Passenger steamships are in almost constant communication with one another, although not within sighting distance, and their approach to port is reported long before the loom of land is visible.

OVER EARTH AND SEA.

THE PROBLEM OF AERIAL NAVIGATION.

Human genius has surmounted one difficulty after another, but the secret so easy with birds, of flight through the air, still baffles man's discovery and invention. Balloons and kites have been brought to a high state of perfection, but all the countless efforts to fly have ended in failure.

Many of the larger flying birds can soar and sail for indefinite periods without the perceptible flutter of a pinion and no one has been able to show how it is done.

The frigate bird sometimes flies for a month at a time without resting for a moment. The condor will eat ten pounds of flesh and then soar to an altitude of three miles where he will sail without the movement of a wing till his food is digested. The frigate bird can go straight upward with a velocity of 100 feet a second to the distance of a mile without any visible wing motion and in fights between eagles or hawks they sustain themselves in the midst of their battle by some means that is yet unexplained upon any reasonable theory.

FLYING MACHINES.

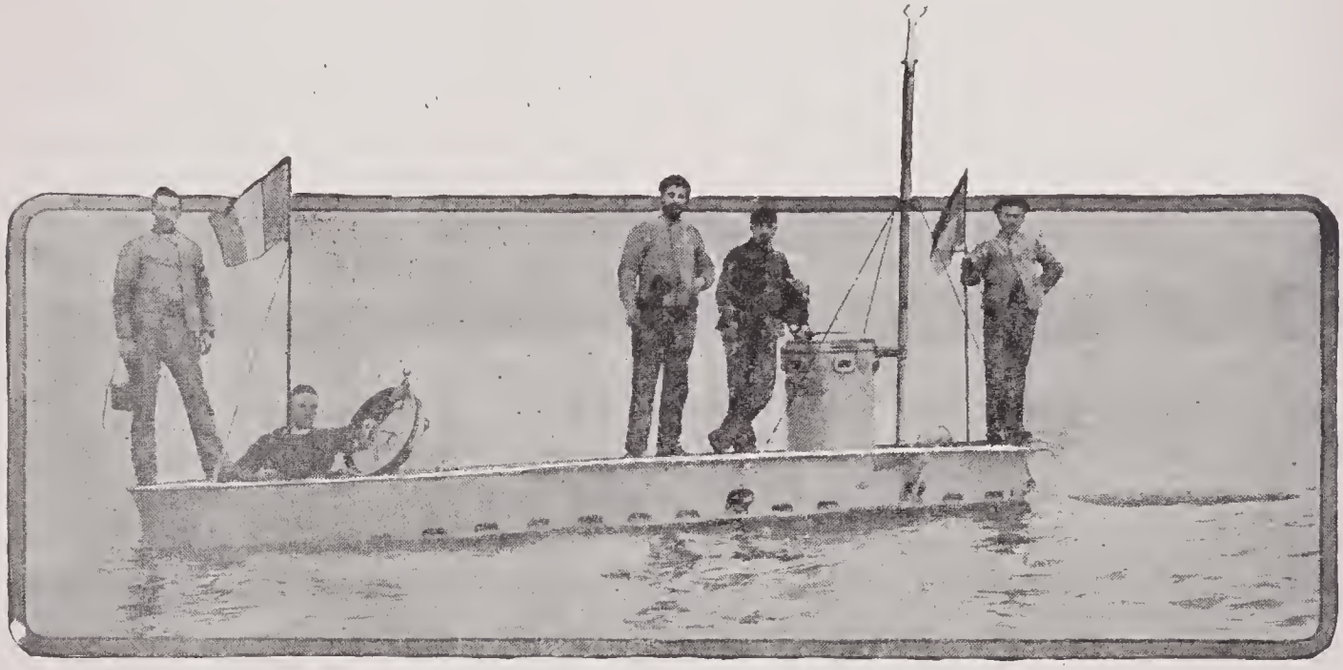
Thus far the dirigible balloon of M. Santos-Dumont and the aerodrome of Prof. S. P. Langley remain the types of the most nearly successful experiments in this direction. Santos-Dumont's achievements, culminating in 1902, were not eclipsed by anything which he was able to accomplish during 1903, although the fact that in the absence of any strenuous wind pressure he was able to alight at his own domicile in Paris and resume his flight at his leisure was duly chronicled. That, however, added nothing to the value of what he had accomplished in preceding years by constructing a balloon susceptible to guidance in any direction, with or against the wind. No improvement worthy of note has been made in his airship, which remains subject to the criticism that stands against all such aerostats, namely, that the great surface the balloon part presents to the action of the wind, considered in relation with the

weight which the machine will carry, renders it of practically small value. For commercial purposes it possesses no value whatever, nor any distinct promise of value. For war purposes it is certainly a vast improvement over the ordinary balloon in that its dirigibility would make it much more effective either for reconnaisance or as a means of dropping explosives upon the decks of hostile warships.

Professor Langley's experiments with his aerodrome have differed from those of the preceding year mainly in applying the principles of his successful machine of 1902 to a machine sufficiently large and powerful to sustain an operator in its flight. Mr. C. M. Manly, who invented the motor engine for the Langley device, proposed to make the first venture in the air with the new aerodrome, and elaborate preparations were made for the flight, but various accidents to the machine prevented the attempt going so far as to launch it into space. Professor Langley's experiments, which have been very costly and which have been promoted by the United States government, do not contemplate the development of an aerostat for commercial purposes, but of a machine which can be utilized to large advantage in warfare.

MANY VARIED ATTEMPTS.

Captain Romeo Frassinetti, of the Italian army, has succeeded so far that his newly devised machine is regarded with favor by the Italian minister of war. Frassinetti's airship is a spindle-shaped balloon to which is attached a series of aeroplanes, some horizontal and the others vertical, the manipulation of which causes the machine to ascend obliquely as well as vertically. Frassinetti claims that his balloon can travel at the rate of thirty miles an hour for forty consecutive hours.



Submarine boat Gymnote. Type of French construction.

Experiments on similar lines to those of Frassinetti have been made by C. M. Mallory, of Chattanooga, Tenn., who has

constructed several machines combining the balloon and aeroplane elements; but thus far his machines have suffered whenever subjected to the influence of strong winds. Mr. Mallory is confident that his "gliding machine," as he calls it, can be successfully guided through the air, but he has not yet demonstrated that his confidence is well founded.

What is perhaps the most interesting of the new devices is a flying machine constructed on the principle of the aeroplane which has been devised by Emil Berliner, of Washington, D. C., the inventor of the telephone transmitter and the gramophone. He has repeatedly tested the invention to his own satisfaction. Mr. Berliner began experimenting in this direction many years ago. Nearly thirty years ago, in a communication to a well-known scientific journal, he proposed as the principle of propulsion for flying machines a stream of compressed air, or gas, and he is using this principle in his present experiments.

PECULIAR THEORIES.

The theory upon which Mr. Berliner is working is that practical flying machines should be in the form of a structure which, when moved forward horizontally, would produce a current of compressed air, with a tail surface for lifting the structure, and, combined with these, a sufficiently light motor, moving the whole rapidly forward. On these lines he designed a small model of a flying machine which, in experiment, has shown its ability to lift, in flying, a weight of more than one pound for every foot of horizontal area at a speed estimated at something less than twenty miles an hour. The model is of aluminum and tin plate, with rods of oak and metal tubing for support, and weighs about thirty-four pounds, including ballast. It resembles three half cylinders, parallel with each other, open at the bottom, and each terminating in a tail similar to the scales in the tail of a lobster. The motive power for horizontal propulsion is supplied by two skyrockets attached horizontally to the rear of the machine, which measures from three and a half to five feet in width by about seven feet in length.

On August 19, 1903, and on several subsequent dates this machine lifted itself from the ground, and in perfectly steady flight reached a height of eight feet from the ground. It also maintained itself for fifty feet at an almost even height of between three and four feet from the ground. No catapult or throwing device was employed, a mere push by hand being given at starting. The main body of the machine consists of arches, open below, as already stated, and sloping toward the rear, where the wide tail ends are attached. The arches, as the machine moves forward, produce a current of compressed air, and at the same time exert upon the under surfaces a power similar to that which explains the action of the parachute. This, of course, helps support the machine, but the main lifting is done by the inclined and outspreading tail pieces catching the air current. Wheels are attached to the machine to facilitate the obtaining of an initial speed on any fairly smooth surface. Experiments are in progress to develop a propeller which will replace the skyrockets,

which, of course, are used only as an expedient.

EFFORTS OF NOTED INVENTORS.

Of the many other experimenters none as yet has produced anything which threatens to rob Santos-Dumont or Professor Langley of the preëminence which they have attained in this field. Sir Hiram Maxim, the famous inventor of the rapid-fire gun, has been at work for years on the problem of aerial navigation, and much was expected from the experiments upon which he has been engaged this year, but nothing has been divulged as to their nature or results. The fact that Maxim regards Santos-Dumont as deserving of most credit so far as present achievement is concerned would seem to indicate that if he has devised an airship it will prove to be one embodying the principle of flotation by the aid of gas. He has announced himself as about ready to make known a new invention of importance as a result of work which he has been doing in this country, but he has not stated definitely that the invention is an airship.

Louis Gathmann, another gun inventor, claims to have solved the problem, but will not put his ideas to the test of practical application at present for the reason that the apparatus necessary would cost $138,000, a sum which he cannot command. Mr. Gathmann believes that rotary motion alone offers the ultimate solution of the problem. With a miniature apparatus he has obtained power at an electric plant for a mechanical contrivance by which a parachute is forced upward by the force evolved in the revolutions of a fan wheel revolving in a horizontal plane. This is not a new idea, having been embodied in a flying machine exhibited in public more than a quarter of a century ago. Mr. Gathmann succeeded in lifting with one-horse power a weight of thirty-three pounds on a rotating blade. From this success he has worked out theoretically a flying machine which would have a 500-horse power engine in an airship weighing 2,500 pounds, or two engines weighing 5,000 pounds in an airship which, with its supply of fuel, would weigh 15,000 pounds. His plan for two engines makes them a factor of safety and also a means of securing equilibrium.

NOVEL MACHINES THAT FAIL TO FLY.

Another inventor is Gustave Whitehead, of Bridgeport, Conn., who has adopted the Langley idea of aeroplanes and has devised an engine weighing only fifty-five pounds which will develop twelve-horse power at 2,500 revolutions. This engine has developed the specified power for ten hours, running on two gallons of kerosene. The aeroplane upon which Mr. Whitehead has been experimenting is sixteen feet long, five feet wide, and has three planes.

Dr. Jose Pena Fernandez, a young Spanish inventor, has an airship which, according to his description, is a dirigible balloon which, in case of collapse, will flutter to the ground in safety. The balloon part is built on a triangular aluminum base. In the inventor's drawings it resembles an egg cut longitudinally. The sides of the triangle are one hundred feet each and the base is thirty feet. Suspended fifty feet below the balloon is a

bicycle seat, from which one of its two propellers can be operated by a pedal. The main propeller is at the apex of the triangle, which is, in effect, the bow of the craft. It is operated by a thirty-horse power gasoline engine. The rudder is at the rear end. A novel feature is a balance weight running backward or forward on a cable, by aid of which the craft can be pointed up or down. In case of the balloon collapsing the machine is supported in the air by its triangular base.

Japanese torpedo-boat laying electric mechanical mines outside of Port Arthur.

CONFIDENCE OF AN INVENTOR.

John Holland, of submarine boat fame, has invented a flying machine in which he, like all other flying machine inventors, confidently expects to fly. The machine is nearly completed and a demonstration is to be made shortly. Speaking of the device, Mr. Holland said recently: "There is not power enough in the wings of a bird to lift one-twentieth of its weight. The wings are only used for propulsion and to start the bird in its flight or retard progress when it desires to alight. A man has power enough in his arms and legs to accomplish all that a bird does; provided he is supplied with the requisite aeroplanes and means of operating them as propellers. Once in motion it is merely a matter of moderate exertion to fly.

"I will have no hesitation in using my flying machine. It is much safer than a bicycle. I know that in the air I will be perfectly safe, yet I have never had nerve enough to mount a bicycle and take the risks of headers and collisions."

AN INVENTOR CRITICISING NATURE.

An airship inventor of the name of John F. Sterle, who is building an air-navigating machine in Milwaukee, says that when nature made the bird it made a mistake in not furnishing the bird with propellers instead of wings. The bird would have been much better off if it had thus been constructed, and it is part of the demonstration he will make before he has finished his air-navigating schemes to show conclusively that this is the case. He says further: Aeronauts who go out with the idea that their ships will rise by the mere application of machinery are demonstrating less brains than their machines. You cannot overcome gravitation by machinery, and balloons are altogether out of the question. I do not intend to rise from the ground with my ship, perfect as it is. I shall build a huge platform, start my machinery, and will never come down, unless I apply the rudder, which you will find at the bottom of the boat. The rudder that will direct its course through space is applied in the rear of the machine, and is independent of the other. As soon as the public wakes up to the fact that I have the only practicable machines ever invented, there will be a wild scramble for airships, more so than there is nowadays for automobiles. Every man will have to build a platform on his roof, from which to make his ascent. By means of the rudders he can return as easily to his roof as a boat finds its way into the harbor. It is a surprising fact that so little has been accomplished in this line up to the present time.

WAR IN THE AIR.

IN THE FUTURE WE SHALL HAVE A "FLYING FLEET."

War in the air is not an immediate possibility; but with the gradual development of aerial navigation it is practically certain that in the distant future the armaments of nations will include flying machines.

The possibilities of "War in the Air" is a problem which must necessarily de-

pend so much upon the details of the machines evolved. The great problem which must be first overcome is to invent a machine capable of carrying a great deal of ammunition, explosive shells, dynamite, and other high-power powder. Up to the present the powers of balloons and flying machines have not been capable of carrying much dead weight. As a matter of fact, inventors are devoting all their skill to reducing weight in the effort to perfect a flying machine.

SPYING BY KITE.

Once, however, a machine can be made to carry a good supply of ammunition, it seems to me that sieges, such as we know them now—Port Arthur, for example—would become an impossibility.

The Japanese do not appear to have made any use of balloons in their war against the Russians, and it is rather difficult to find a reason for this; but they have made use of man-lifting kites exactly similar to those I have frequently experimented with, and which were purchased by the Japanese government from my agent about twelve months ago. Those kites are capable of lifting a man to an altitude of about 1,000 feet, and during the South African war experiments were made to manipulate a camera from that height with the object of securing photographs of the enemy's lines. The results were not very good; but a camera is not at all necessary for that purpose if a man, sent up in the air by kite, has a good knowledge of what is required, and is capable of drawing simple, but accurate, plans of the enemy's lines.

The nation which first gains possession of a really efficient airship, a machine capable of traveling at a great speed and remaining in the air for hours, will simply revolutionize warfare.

WHEN THE FLYING MACHINE COMES.

That time will come when the flying machine reaches the same stage of evolution as the submarine vessel stands today, and, as to how long it will be before we see a really efficient airship, everything must necessarily depend upon whether men will be found who will devote sufficient energy to experimenting. It seems to me to be entirely a matter of a man giving the subject his whole attention, with wealth to back him up, to evolve a practical airship—a machine capable of fighting.

An aerial warship would compel the nations to make drastic alterations in their armaments, in the first place. For instance, naval guns are unable to fire upwards—that is, their upward elevation is very slight, and they could not concentrate direct fire on a machine hovering over the vessel; and, to a very large extent, this applies to field artillery. It would become essential to introduce an entirely new weapon into both services to cope with an armed flying machine.

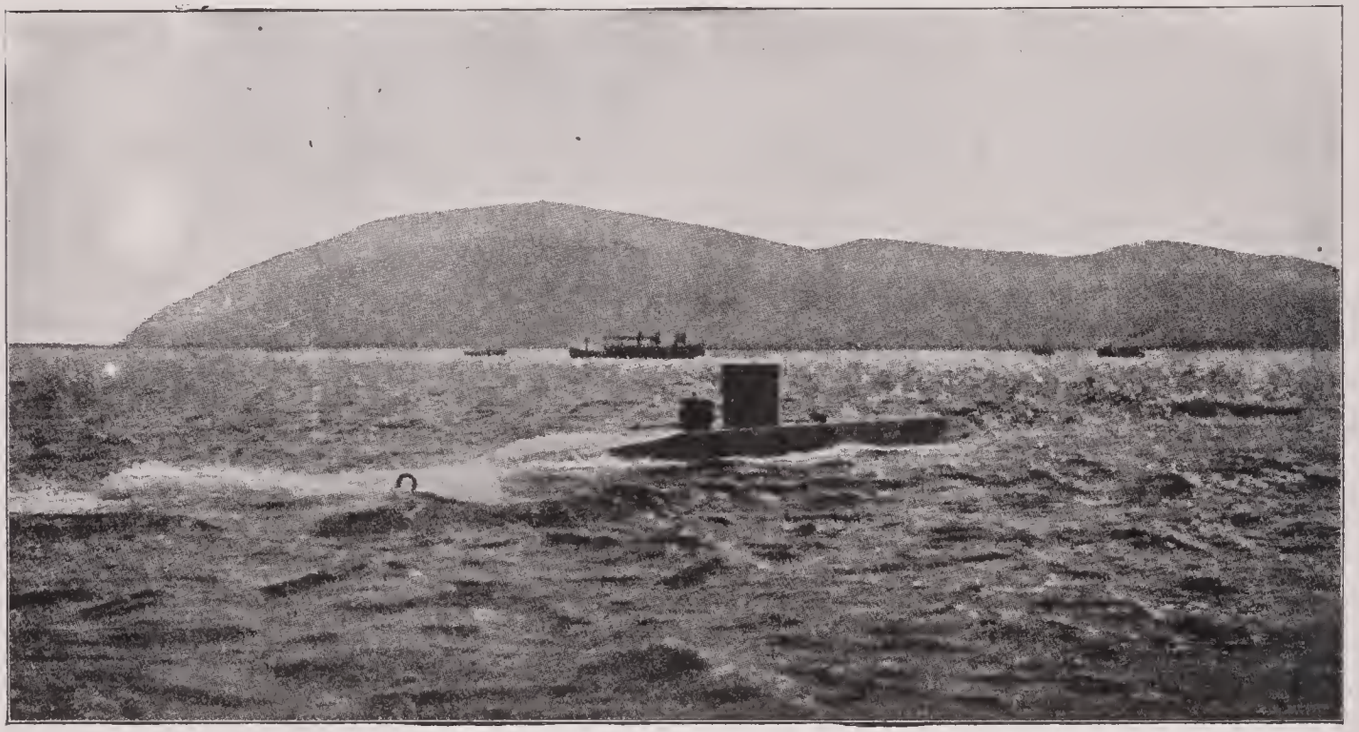
The arming of an aerial warship sounds a very difficult task, but once having secured a machine capable of carrying dead weight, the problem becomes at once half solved. As I have already stated, inventors are at great pains for the moment to reduce to the lowest possible maximum all weight, and Santos-Dumont has achieved fame for the lightness of his apparatus. He carries a very

small supply of ballast with him, and his machines are of the lightest possible description. At the present moment I am engaged in reducing the weight of a motor, and the amount of time and trouble which it involves is enormous. It is a two-horse power motor, and, so far, I have reduced the weight to less than twenty-five pounds. I hope to still further reduce it; but it shows the tendency of the moment, and nobody could conceive, unless they have tried, what time and labor such experiments entail.

Mounting guns on a flying machine would be a delicate undertaking, but I can quite conceive that the time will arrive when flying machines will carry armament of no mean calibre. There should be no danger in using gunpowder, and I do not anticipate that the firing of a shot from an airship would throw the machine off its equilibrium. There would have to be careful adjustment, of course; but presuming that a ship was traveling at a great pace there should be little to fear on the question of balance.

FORTS IN THE CLOUDS.

Reverting again to the effect aerial warships would have on sieges, one must be struck with the great alterations which would have to be made in protecting fortifications. Forts would have to be protected with bomb-proof domes, and, even then, the effect of a high-power explosive being dropped from an enormous height would be terrific in its results.



Style of French submarine boat.

With aerial warships in action, aerial fortifications would become a necessity, otherwise sieges would only last as long as an "aerial enemy" permitted, whilst the unprotected parts of fortified towns —and they would necessarily include the great naval dockyards—would be at its mercy. Aerial fortifications conjure up uncanny visions to the mind's eye.

WANTED! A DEFINITION.

Military flying machines have been built for various governments, but none have turned out to be efficient. Dr. Barton and Maxim built machines with the idea of using them in warfare, and Langley built one for the American government. Because all efforts have failed up to now, however, I do not see that it means permanent failure. They are going ahead with aerial machines in America just at present, and in a few years we may see Englishmen take the problem in hand again.

The Hague Convention was responsible for some stupid remarks some time ago on the question of war in the air; but it is almost impossible to define in exact terms what really does constitute an aerial machine. A rocket or a shell may be called an aerial machine. It flies through the air and falls to the ground, just as a flying machine would do, the only difference being whether there is a man in it or not.

SPEED ON THE SEA.

TURBINE AND ELECTRIC MOTORS CUTTING TIME.

It took Christopher Columbus seventy days to cross the Atlantic Ocean—but that was four hundred years ago. At the present moment the fastest ship crosses in five days, six hours and twenty minutes. From seventy days to less than six days is a long jump, but Lewis Nixon, the Cramps and Richard B. Painton, three expert ship builders and marine inventors, are getting ready to launch an ocean giant which will cross the ocean in three days—will, if necessary, make a round trip to England and back again to New York, between Monday morning and Saturday night.

This new transatlantic racer is to be christened the Meteor. When in the water she will look very much like one of the present big ocean steamships, the only particularly noticeable difference being that her smokestacks will be six in number. Four stacks is the largest number on any steamship now in commission.

But inside her hull and down under her water-line the machinery will be quite different from that of any of the great liners which are now making their trips from New York to Liverpool or Southampton in about six days.

SPEED LIKE AN EXPRESS TRAIN.

Sixteen powerful screw propellers, operated by electric motor power, will drive the Meteor through the water at a uniform speed of about 45 miles an hour. This is equal to over 1,000 miles a day. The Oceanic, of the White Star line, which plows across the Atlantic in about six days with the greatest ease imaginable, has only two propellers, situated one on either side of the stern. It is easy to imagine from what the Oceanic does with two propellers, what the Meteor will do with sixteen.

It will be possible for a business man to eat his breakfast in New York on Monday morning, preparatory to going aboard the steamer Meteor, which we will say is to sail at 5 a. m. With fa-

vorable seas and the sixteen propellers driving the ship through the water at full speed he should reach Liverpool late Wednesday night. To be sure, he will not have much time to spend ashore if he has to be back in New York by Saturday night, but the Meteor will be capable of getting him back home again on time.

Owing to the enormous speed at which the Meteor will travel it has been necessary to introduce several interesting innovations in shipbuilding plans in the construction of this newest and fastest of all ocean greyhounds. Chief among these is the very tall nose, or bow, which has been designed with a view to keeping the ship from dipping too deeply while cutting her way through head-on seas. Passengers on the fastest ocean steamships have frequently noted with no small consternation the habit of their boat to push ahead right through the billows while going at full speed, instead of topping them as a slow-going steamer would. Even such enormous vessels as the Oceanic, which stand out of the water as high as a four or five-story building, have a habit of plunging straight through mountainous seas right ahead of them, so that the forward deck is completely submerged for a few moments. This will be obviated to a considerable extent in the construction of the Meteor, as stated above, by the extra tall bow, which rises sufficiently high above the water to clear the tops of the average billows to be encountered in a trip across the Atlantic.

The Meteor will measure 600 feet in length, with a 62-foot beam, and she will have a displacement of 30,000 tons. These figures, reduced to plain English, mean that she will be slightly larger than the biggest Atlantic liners of the present day, with one or two possible exceptions.

Her interior accommodations will be larger than those of any other ship afloat on account of the substitution of electricity for steam. There will be steam engines and batteries of boilers on the Meteor, of course, but only those of a new and compact type sufficiently large to drive the generating dynamos which will run the motors for turning the sixteen screw propellers.

There are eight propellers on either side of the ship at the stern. They are arranged in twin sets, one propeller working behind its mate. Each propeller is built with only three blades, instead of the customary four blades. The reason for this is that if a four-bladed propeller was turned at the rate of 1,500 revolutions per minute, at least two of the blades would sweep round and round without finding any water to offer resistance to the blade. The blade ahead would be too short a distance away to give the water time to fall back to meet the next blade. And so for the Meteor a special type of screw has been designed with only three fans placed equi-distant apart.

THE LIMIT OF STEAM POWER.

"One hundred and fifty revolutions per minute is the limit of steam power," said Mr. Painton, the inventor of the multiple electric propeller. "The electric reversible motors to be installed on the Meteor will make 1,500 revolutions per minute. The power is to be transmitted by electric wires direct from the dynamos to motors built on the propeller shafts. No

belting or couplings will be required, and the machinery is simplicity itself.

"I believe that there will be practically no limit to the speed at which the propellers can be driven under this system. I have given the revolutions as 1,500 per minute because I estimate that to be the best uniform speed at which the Meteor's propellers will be driven.

"The only noise made by the Meteor's engines will be similar to that of a flywheel or fan in motion. Another advantage is that the terrific and stuffy heat from furnaces and steam pipes will be obviated.

"One distinct feature is that the screws extend from stem to stern, and thereby tend to maintain an equilibrium that will materially diminish the pitching and rolling motion of the vessel. The long shaft being dispensed with, there will be no thumping and clanking of machinery and no jar that would otherwise be felt from the horizontal motion."

NEW TURBINE ENGINES.

The newest design of the most efficient turbine engine is to be used in driving the generating dynamos. This will represent a great saving in weight of machinery and in space, which in the ordinary type of ocean liner has to be devoted to the coal. The average Atlantic passenger ship consumes about 500 tons of coal every day during the trip, or three thousand tons between New York and Liverpool. The electrical and turbine engines to be installed in the Meteor will reduce the coal consumption per day by one-half. This alone will represent a saving of nearly $14,000 for coal for each voyage across the ocean.

Mr. Edwin S. Cramp of the famous Cramp shipbuilding firm, was among the first to recognize the value and adaptability of Inventor Painton's reversible electric multiple propeller in connection with the turbine in constructing the three-day Atlantic liner.

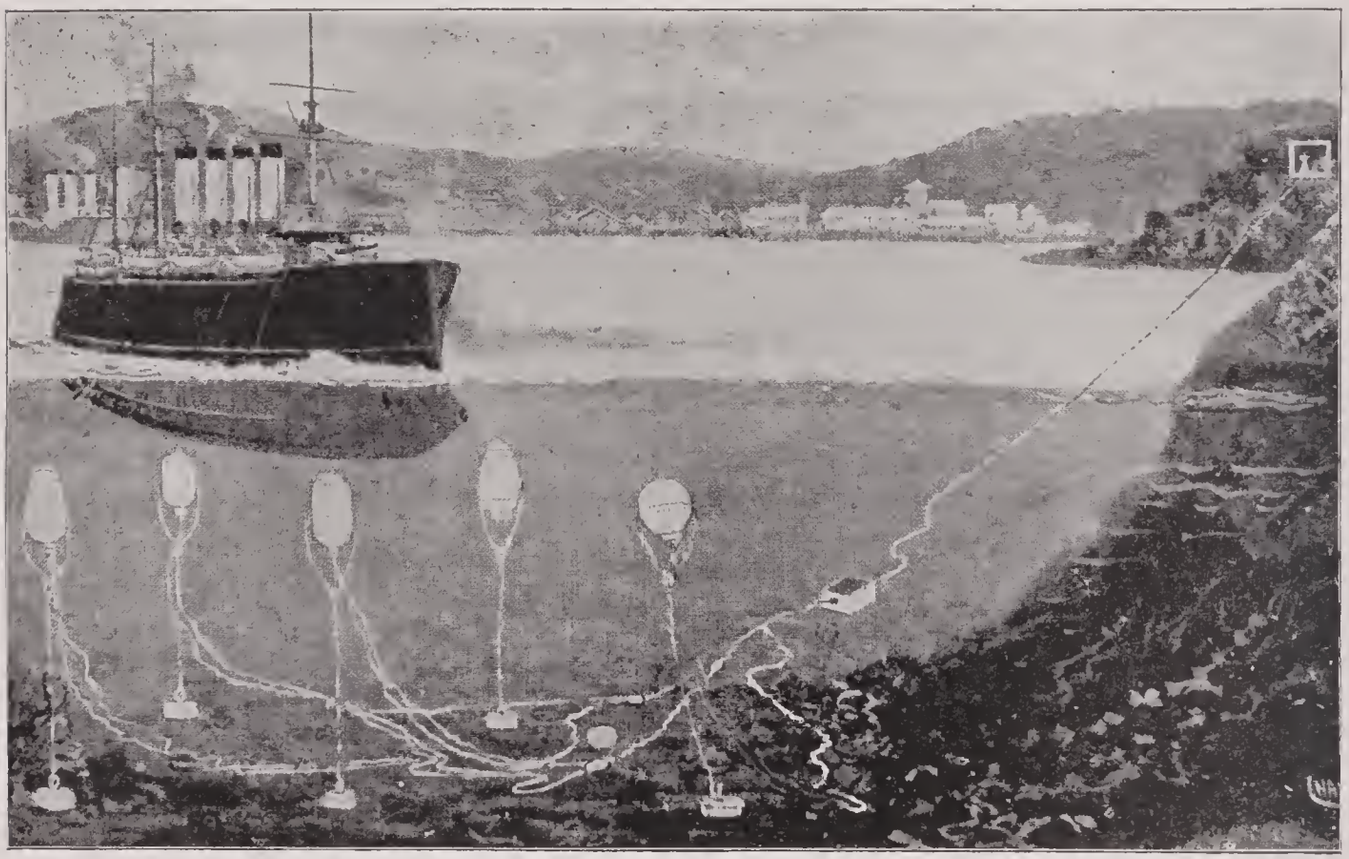
"It is a decided improvement," he said, "upon the Turbinia, after which the Cobra and Viper, the speedy British torpedo boat destroyers, were built. In addition to the enormous increase to be gained in speed there will be a great economy in fuel, space and steam. The employment of a reversible electric motor and dynamo to run the propeller shafts is a most important gain."

It will cost over $2,000,000 to complete the Meteor and fit her out for her first ocean voyage. If she succeeds in crossing the Atlantic in three days, three or four more ships of the same type will be built to operate a three-day service between New York and one of the principal ports of England, presumably Liverpool or Southampton.

With the Meteor in commission some interesting comparisons may be looked for between her performances and those of the two projected Cunarders, the Caronia and Carmania. Both these vessels are to be of the turbine type and it has been estimated that they will be able to cross the ocean in five days flat. It is not yet known whether the new Cunard boats will be electrically propelled or not, but this is scarcely probable, as American shipbuilders who have combined to construct the Meteor control the exclusive patents taken out by Mr. Painton for this system. The new Cunarders will have 62,000-horse power, as compared with

the 100,000-horse power equipment of the Meteor.

A race between one of the turbine Cunarders and the Meteor will prove interesting whenever it takes place. In case the Caronia and Meteor sailed from New York for Liverpool on the same day, the Meteor could reach England, turn around and be more than half way back home again before the Cunard liner reached port in England.



Submarine mines guarding a harbor entrance. The object of these mines is to guard the entrance. They are metal receptacles which hold a large charge of explosive. Some have a "contact head," which if touched by a vessel explodes the mine. Others are discharged by electricity controlled from the shore, and fired when a ship is near. The Russians used the former in Port Arthur.

RECORDS OF SPEED.

In 1850 the Britannia sailed from Boston to Liverpool in fourteen days eight hours, which was then considered phenomenal time. Several vessels see-sawed for the crown until 1877, when the White Star line, formed by Ismay & Imrie, with their Britannic, ran away with the ribbon in seven days ten hours and fifty-three minutes. Dethroned by the Inman line in 1889, when the City of Paris covered the 3,000-mile course in five days nineteen hours and eighteen minutes, the White Star people regained the crown when the Teutonic reduced the record by three hours.

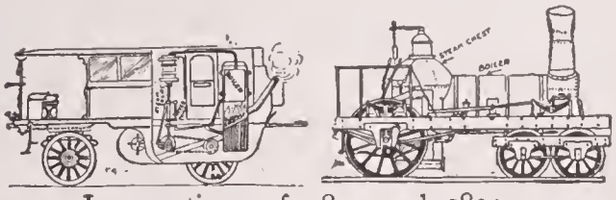
This record stood until the era of the great modern leviathans, inaugurated in 1893, when the Cunard Company floated the famous Campania and Lucania, which held the trophy in the order named until the appearance of the Kaiser Wilhelm der Grosse, in 1897. This great German ship, after warming up in sev-

eral remarkable trials, gained her stride in May, 1898, and with a gentle breeze and smooth sea she distanced all rivals in a westward run of five days seven hours and ten minutes. Her most dangerous foe was to come from her own country, for the Deutschland, after coquetting with the blue ribbon of the ocean for three years, bore it off with considerable ease last September, by racing from New York to Plymouth in the Queenstown time of five days six hours and twenty minutes.

EVOLUTION OF LOCOMOTIVES.

Especially interesting alike to American and European sightseers at the World's Fair is the railroad exhibit of early types of locomotive engines.

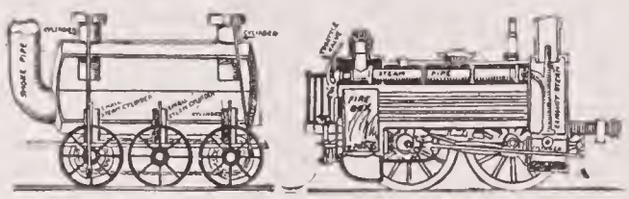
Stephenson's locomotive of 1815, a sectional view of which is given in the illustration, is among the important features of the exhibit. This engine, an improvement upon an earlier Stephenson



Locomotives of 1833 and 1834.

design, is fitted with two vertical cylinders, the connecting rods attached directly to the four driving wheels. It has ball and socket joints to unite the rods with the cross-heads and cranks, and the two driving axles are connected by an endless chain. In this machine the forced draft obtained by the impulse of the exhaust steam was adopted, doubling the power of the machine and permitting the use of coke as a fuel.

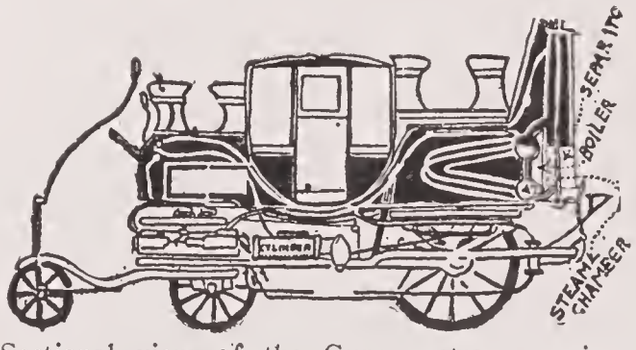
The steam coach "Autopsy," made by Walter Hancock in 1833, ran from London to Brighton, next between Finsbury square and Pentonville, and for a time in the crowded streets of London, with much success. Its mechanical operation is shown in the illustration. The boiler supplied steam to a steam engine coupled to a crank shaft.



Stephenson's locomotives of 1815 and 1833.

Gurney's steam carriage, built in 1827, ran for nearly two years in and about London, and made several long journeys, one a distance of eighty-five miles in ten hours, including all stops. His improved engine of 1828, shown in the illustration, is of special interest as exhibiting a very excellent arrangement of machinery, and as having one of the earliest of "sectional boilers." This is regarded as one of the best designs brought out at that time.

In 1834 Matthias W. Baldwin, founder of the Baldwin Locomotive Works, built for Mr. E. L. Miller, of Charleston, S. C.,



Sectional view of the Gurney steam carriage.

a six-wheeled engine called the "E. L. Miller," with cylinders ten inches in diameter. He made the boiler of this engine of a form which remained standard many years, with a high dome over the firebox.

FASTEST RAILWAY TIME EVER MADE.

Mr. Volkmann was one of the privileged few who have traveled in the new electric express between Marienfelde and Zossen, near Berlin—fifteen miles in eight minutes. The journey was one of a series arranged as tests by some German engineers, aided by the War Office, and during the run a speed of 130½ miles an hour was attained—a world's railway record.

Before starting the writer was insured against risks in the Deutsche Bank. The chief excitement was to watch the meter record the gradually increasing speed. The car is 70 feet long, somewhat boat-like in shape; at each end its windows meet in a point, a kind of nose to pierce the air in front, and at each end also there is a place for the motorman. On each side of the car is a system of resistances designed to catch the air and carry it inside in currents for cooling purposes. The track, of course, is unlike an ordinary track. Four, not two, rails are laid, and broken rock is set as ballast, the object of the double track being to prevent the train jumping the rails. Even now it is doubtful how a curve could be negotiated at such a speed, the Zossen line being almost straight. The following description of the trip will be read with interest by many:

The motorman slowly turned on the current of 14,000 volts, and the car began to move gradually forward. As it did so, it made a humming noise, but we felt no kind of sensation or jerkiness, the motion being smoothness itself. Our first recorded speed was only forty-five miles, but in a little over a mile this had increased to sixty-eight, and then to eighty-five.

Faster and faster, and we had reached a speed of 105 miles, when my sensations of rapid travel began in earnest. There was, of course, the old illusion of passing objects. Trees, buildings, posts, seemed to be rushing past us, and we ourselves to be stationary. All the time we felt a desire to go faster and faster. Even when traveling at 130 miles an hour we chafed that we moved so slowly.

Once we had attained our high speed we began to notice a strange, puzzling, musical sound—a continuous hum. Even my experienced fellow-travelers themselves could not exactly account for it, as it did not come from any vibration of machinery; but at length we found the solution. Our passage was so furious that stones, sand, dust—every movable object on the track, whipped in dozens against the carriage with such rapidity as to give forth a sustained note. A rushing sound behind us came from nothing else than the fallen autumn leaves, which followed us in a cyclone.

Stranger, and rather gruesome, was the sight that greeted us on the windows of the train as we got nearer to Zossen. We were traveling literally in an engine of death, for crushed against the glass panes in scores were the dead of the insect world. Wasps, bees, gnats, flies, had been caught in their flight, and the windows were literally stained with their blood. Not even birds escaped the approaching monster, the death of several being signalled to us by sudden raps on the glass.

Unique elevator bridge over the Chicago river.

SPEED OF RAILROAD TRAINS.

On May 25, 1903, a train on the Lake Shore Railroad made the run from Toledo to Elkhart, a distance of 133.4 miles, in one hour and fifty-four minutes, or at an average speed of 70.2 miles an hour. A New York Central train in March did 91 miles at a speed of 71 miles an hour. The fastest long distance run of the year was made by an Atchison, Topeka & Santa Fe train, between Chicago and Los Angeles, a distance of 2,267 miles. This was made in 52 hours and 49 minutes, or at an average speed of 42.8 miles an hour, including stops. The fastest recorded time ever made was accomplished on the military road between Marienfelde and Zossen, in Germany, on October 6, 1903, when a speed of 125.8 miles an hour was developed. This road is electrically operated, by the three-phase system. The car used in the test was equipped with four motors, capable of developing 1,100 horse power. At this rate of speed Philadelphia could be reached from New York in 43 minutes, and the distance from New York to Buffalo, 439½ miles, could be made in three hours and a half. Another test made on the Marienfelde-Zossen road later in October was reported to have resulted in a speed of more than 130 miles an hour.

EXTENT OF RAILROADS IN THE UNITED STATES.

In 1851 the American Railway Guide for the United States, published in New York, consisted of 144 pages, 5¼x3¾ inches. It contained the time tables and information regarding 149 railroads. But the Official Guide for the United States for August, 1902, contains the time tables and information regarding 957 railways, requiring over 900 pages, 7⅛x10⅛ inches, to show it. In 1851 there were a little over 9,000 miles of railway open for traffic in the United States. In 1903 there were more than 200,000 miles in operation, with new lines constantly being built and others projected.

STABLING THE IRON HORSE.

LOCOMOTIVES AFTER A RUN RECEIVE A THOROUGHBRED'S CARE.

Anyone at all familiar with railroads has seen the engineer dismount from the cab, oil can in hand, as soon as the train has come to a stop at some way station; seen him walk slowly about the ponderous machine, feeling of each bearing with his free hand as he filled the cups with oil; seen him, perhaps, tap a valve gently with a wrench or examine critically some ill-working air pump.

To any man all this is interesting, but how many are there in all the vast crowd that enter the city daily at the great terminals who can tell offhand what becomes of the train when once the cars are emptied of the passengers? To be sure, they have seen the cars on a siding out in the yard. They know, perhaps, that a roundhouse is a place where engines are kept when not in actual use. But beyond this the ideas of the ordinary man are a bit hazy.

As soon as the passengers have left a

train that has just come in from a long, dusty run it is backed out into the yard and the cars are set off on a side track. Men go upon them at once and begin to put them in readiness for the next trip. The windows are washed, cars freed from filth and dirt, seats cleaned, water tanks cared for and the lighting apparatus put in order.

PUT IN THE ROUNDHOUSE.

The locomotive, after leaving the cars, proceeds at once to the roundhouse, where the ponderous machine also receives a proper overhauling. First of all, the tanks are filled with water and the fuel supply is replenished. Then a few puffs bring the firebox above the ashpit, where the fires are cleaned and dumped all together. The next thing is to stable the great iron horse.

The roundhouse itself is a most uninviting place, with its soot-begrimed walls and smoky interior. These buildings are all constructed on the same general lines, low, one-story structures, generally built of brick and semicircle in shape. The centre of the circle is the centre of the turntable. Arranged along the inner side of the building is a line of doors, each exactly like its neighbor. Under each runs a track of standard gauge, giving the whole an appearance not unlike a spider's web, the centre of which is the turntable.

The turntable itself consists of a pit walled with stone, across which is a bridge free at the ends but balanced at the centre on a spindle. Rails are laid across this, as if it were part of the roadbed.

When the fires of the locomotive have been cared for the engineer runs his machine upon the table. With deft hand at the throttle he brings it to a stop at the precise point where the hundred tons of steel balance on the spindle that supports the bridge. Then the ponderous mass is slowly revolved until the required track is reached and the engine is backed into the roundhouse.

ENGINEER'S WORK IS DONE.

Once within the house the engineer's duty is done. He has but to go to the office and report in a book prepared for the purpose any repairs that are needed, and he can go home assured that his machine will be ready for him when he starts on the next run.

The engine is now turned over to the roundhouse crew, who go to work on it at once. The attention that a locomotive receives on arrival at the roundhouse is about the same as one would expect to see bestowed upon a race horse. Wipers go over every inch of the surface carefully, removing all dust and oil. Others drop into the pit beneath the machine and wipe the running gear. The headlight is carefully cared for and the brass polished. In fact, the whole machine is put in first-class shape in every way.

Throughout this work keen watch is kept for any signs of broken parts, and any found are repaired. The hundred or more flues are cleaned by steam pressure.

An engine seldom comes to the house that does not need repairs of some sort. The delicate mechanism is constantly becoming broken, and unceasing attention is required.

TIGHTENING DRIVE WHEEL TIRES.

One of the most interesting of all the repairs that are made in the roundhouse

is the tightening of the tires on the drive wheels. Each wheel is surrounded with a heavy steel tire. These occasionally work loose, and it becomes necessary that they be tightened without sending the locomotive to the shops.

To do this a stream of oil is fed automatically upon the tire and allowed to burn as it runs down. The result is that the whole rim is soon a circle of flame. That is kept up for a long time, and the tire, being heated faster than the wheel itself on account of the proximity of the fire, expands until the thin pieces of sheet iron can be inserted between the wheel and the tire. When the tire has again become cold it contracts and clutches the wheel hard and fast.

The cumbersome repairs, such as turning down worn drive wheels and replacing boilers, go to the shops, where lathes, cranes and forges are to be had. But all the minor troubles are remedied at the "stables," and the foreman of the roundhouse is responsible for the condition of the engines. He is the man to whom all look in an emergency and it is he who must look forward and plan for the repairs in such a way as not to interfere with the regular operation of the trains.

GREAT GUNS.

COAST DEFENSES OF THE GOVERNMENT.

The most advanced type of carriage on these guns is known as the United States disappearing carriage and is from the designs of Buffington and Crozier. Because of the perfection of this carriage over those formerly in use Crozier was promoted from captain to brigadier-general and was made chief of the ordnance department. This is the longest jump ever made in any one branch of the army and is exceeded only by that of Gen. Leonard Wood, who was promoted from the medical to the service department.

In its principle the carriage is practically a lever. On one end rests the gun and at the other is the force which raises the gun from the loading to the firing position. The fulcrum of the lever is in the middle and is movable, sliding backward and forward on rails. When the gun is to be raised to the firing position counterpoise slightly heavier than the loaded gun comes into play and sinks downward in a pit below the carriage. This weight is released by an electrical device which can be operated from any convenient distance.

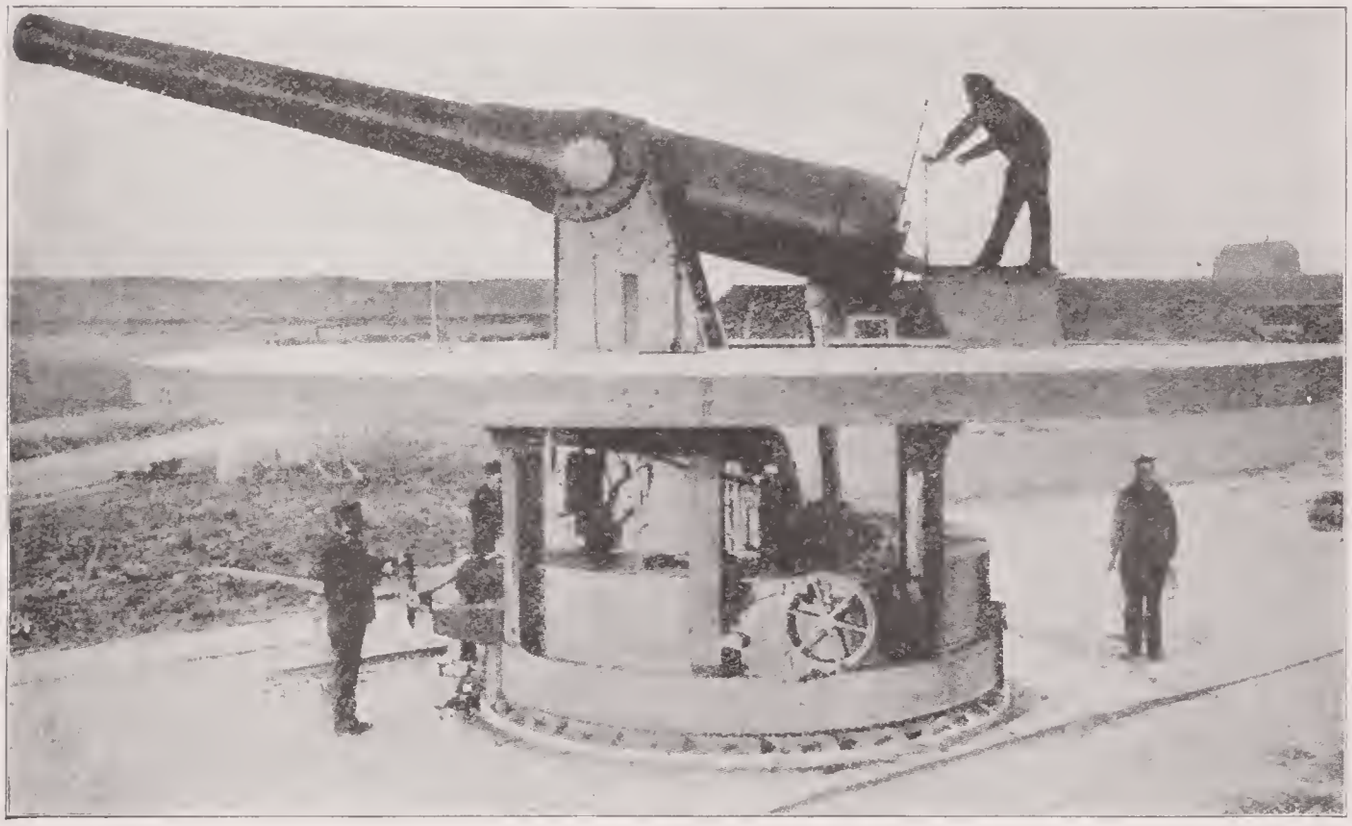
The recoil of the gun, when it is fired, is sufficient to send it traveling backward and at the same time the weight is raised and held by a catch until the gun is to be put into firing position again, when the catch simply lets go and the weight does the work. On its recoil the gun always comes into a proper position for loading, and when it is raised comes up at the same angle at which the last shot was fired.

The sighting of the gun is done while it is in the loading positon and the gun need not be exposed above the parapet for more than a few seconds, while the projectile is being discharged.

Traveling tongs suspended from a trolley arrangement pick up the shot from the galleries below the gun and run it to the hoisting elevator, which takes the shot and four bags of smokeless powder

for the load up to the charging platform. After the tongs are placed about the shot, men's hands hardly touch it in its progress into the breech of the gun. The bags of smokeless powder are loaded by hand.

Every part of the machinery of the gun is operated by electricity. The carriage is raised and swung about into the proper position for firing with perfect ease, and when the final aim is taken the gun is discharged by an electric spark.



A Japanese defense and siege gun. It is what is known as a 10-inch gun, mounted upon a disappearing carriage. The gun alone weighs 21 tons, and the carriage 61 tons. It fires a projectile 475 lbs. at a velocity of 1,900 ft. per second.

RANGE FINDERS FOR GREAT GUNS.

Two range finders are installed with each gun, as they are an important part of the gun's activity and usefulness. These are telescopes much like those on a surveyor's instruments. They can be turned from side to side and their position to the right or left of the central line on the scale at their base determines the place towards which the gun must be pointed.

Although the projectile leaves the gun with a velocity of 2300 feet (almost half a mile) a second the gun is never trained on the moving object which it is expected to hit, but is pointed some distance ahead of it. It is one of the niceties of the art of war to so point the gun that the ship to be destroyed and the projectile, reach the same place at the same time.

While the projectile is traveling eight miles in six seconds the ship, if traveling at a 12-mile-an-hour rate, has advanced nearly 108 feet, and to calculate the spot at which both will come together is the work of the officers in charge of the range

finders. The calculation is an elaborate one, but it must be accurately done in a few seconds after the readings of the range finders are telephoned to the "plotting room," as it is called.

In spite of the difficulties attendant upon such rapid-fire mathematics the huge guns, when fired at a target moving at the rate of 12 miles an hour, have a record of four hits out of four shots fired, in less than five minutes.

ACCURACY OF GREAT GUNS.

So great is the accuracy of the gunners that captains of tugs which tow the target, with only 500 feet of rope between them and the target, have said repeatedly that they never feel the least anxiety.

Various tales are told of the severity of the shock when these big guns are fired and its effects on the ears of the gunners. Most of the stories are more spectacular than true. Some captains do advise their men to put cotton in their ears, but the shock, even to the man on the gun platform, is much less than to one who stands a quarter of a mile in front of the muzzle.

The angle of the parapet protects the man behind the gun, although it does not protect the doors of the fort. These doors are of iron and are strongly fixed in their frames, but quite often they are torn from their hinges by the suction of the air, as a vacuum is created when the gun is fired.

Each of the 1000-pound shells is filled with a modern high explosive known to the department as "explosive D." It is the best that has ever been discovered as its rate of explosion is not so rapid as that of guncotton, which has a tendency to break the projectile to small bits and do little damage.

The shell is exploded by a "delay action" fuse, which allows the shell to penetrate the interior of a ship before it shatters. This fuse is timed to explode a certain fraction of a second after it strikes armor plate. It will penetrate a 9-inch Krupp plate at a distance of 7,000 yards.

The cost of one of these guns is enormous. Forty years ago a small fleet of battle-ships could have been built for the cost of a fully equipped emplacement containing a 12-inch rifle and carriage. The projectiles are made of hardened steel and they, too, are costly. The service armor-piercing kind are never used in practice, cast-iron being substituted.

It has been estimated that the life of the best 12-inch gun is 500 shots. After this number have been fired the rifling grooves become so worn down that the gun goes to the scrap heap and then to the furnaces, where it is melted and cast anew.

The six-inch rifle is on a carriage similar to the 12-inch, except that it has no motor to move it from side to side. It is so accurately poised that it can be moved around with one finger.

The 12-inch coast defense mortar is never raised above the edge of the fortification, but it has a record of one out of four shots dropped upon a target moving at the rate of 12 miles an hour. These guns send their projectiles five miles into the air and the difficulty of correct aim is vastly increased.

GREATEST BATTLE-SHIPS.

SIX NEW BRITISH CRUISERS THAT COST $40,000,000.

The batteries of these battle-ships are such as never before have been put into any fighting ship, on a displacement of 16,500 tons, or 150 tons larger than the previous largest. They will carry fourteen big armor-piercing guns.

The advantage in the new ships lies in their greater number of 9.2-inch guns. This weapon is the most powerful in existence, firing a 380-pound shell two or three times a minute, and driving it through thirty-five inches of iron. It is more powerful than any gun of similar type mounted in foreign battle-ships. The four 12-inch guns fire 850-pound shells through some four feet of iron.

The four new armored cruisers are also to be remarkable for size, being the largest cruisers built for the British or any other navy. They are to be known as the Minotaur class, and will steam twenty-three knots. They displace 14,600 tons each, or 400 tons more than the Drake class. They will carry four 9.2-inch guns each, of the same type as those in the Lord Nelson class, and ten of the new 7.5-inch guns, which fire four 200-pound shells a minute through more than two feet of iron.

GREATEST WAR-SHIPS AFLOAT.

Both the cruisers and battle-ships will beyond comparison be the best vessels of their class afloat. The six new ships will represent a capital of $40,000,000. They are equipped with coils of tubes for the water boilers, thus generating steam rapidly and powerfully.

THE LOUISIANA.

MOST POWERFUL WAR VESSEL IN THE WORLD.

The Louisiana is typical of the present climax of the art of battle-ship designing, and nothing now building abroad is her equal. For a fighting machine she will represent when ready for sea service a formidable mass of 18,000 tons of shod might, and the single craft that shall stand in her way has everything against her. The Louisiana will have a water-line length of 450 feet and a maximum beam of 77 feet. Her moderate draft of 24½ feet will make it possible for her to carry on an aggressive warfare in waters ordinarily too shallow for foreign ships of lesser powers, while she will be able to safeguard our seaports on the gulf.

The ship will have a maximum speed of eighteen knots an hour, and she will carry 2,200 tons of coal, which will be enough to give her a radius of action of twenty-five days' steaming a twelve-knot jog. Her great engines will develop 16,500 horse-power.

The fighting equipment of the vessel will consist of no fewer than seventy-six guns. The main battery will be a force of four 12-inch, eight 8-inch and twelve 7-inch breech-loading rifles. The secondary battery will be made up of twenty 14-pounders, twelve 3-pounders, six 1-pounders of a murderous automatic type,

two 1-pounders of a semi-automatic design, two 3-inch field pieces for landing parties and eight small machine guns. All of the guns of the secondary battery are rapid-fire, and so, too, should the 7-inch guns of the main battery be termed, for they will be able to fire three or four times a minute. This 7-inch gun is the essentially novel feature of the ship's batteries, and at the proving grounds has shown the remarkable velocity of 3,000 feet a second, the 165-pound shot being fired by a charge of only seventy-four pounds of smokeless powder. The 12-inch guns fire 850-pound projectiles and the 8-inch guns fire shell weighing 250 pounds. In a minute's time, from either broadside, the Louisiana could discharge from her main battery alone more than five tons of case-hardened steel.

To safeguard the vessel against an enemy's shot, she will carry a wider and more generous distribution of armor than heretofore allowed. The water line belt will reach from bow to stern, and it will be nine feet three inches wide, with a maximum thickness of eleven inches for a distance of 200 feet amidships in wake of the boiler and engine region. Thence forward and aft, respectively, it will gradually taper to four inches at the bow and the stern. Immediately above this heavy amidship section, for a distance of 284 feet, and reaching up to the gun deck, the sides will be six inches thick, while above this again to the main deck and throughout the region occupied by the 7-inch guns the sides will be seven inches thick. Heavy athwartship bulkheads, six and seven inches thick, will guard the ship from a raking fire. The protective deck, which will reach from end to end of the ship, will be one and one-half inches thick on the flat portion and five inches thick on the sloping sides.

The Louisiana will have the immense complement of 800 officers and men.

MARVELS OF THE GREAT STEAMSHIPS.

If a mariner could be resurrected from ancient Phoenicia and take a trip from New York to Liverpool on the new White Star liner Baltic he would think that he had never been on earth before.

The magnificent new ocean liner is one vast complex and elaborate machine—a triumph of human genius, scientific computation and mechanical skill. It safely carries 3,000 passengers and a crew of 300 men beside. But a town of 3,300 inhabitants is quite a community, and might have a mayor. Such absurdities have occurred. The great ship also at the same time transports 28,000 tons of freight. Thus, not only the inhabitants of the town and the mayor could be borne across the sea, but everything in the miniature city, for it is not likely that all the goods in the stores and household effects of all the people would weigh more than 28,000 tons.

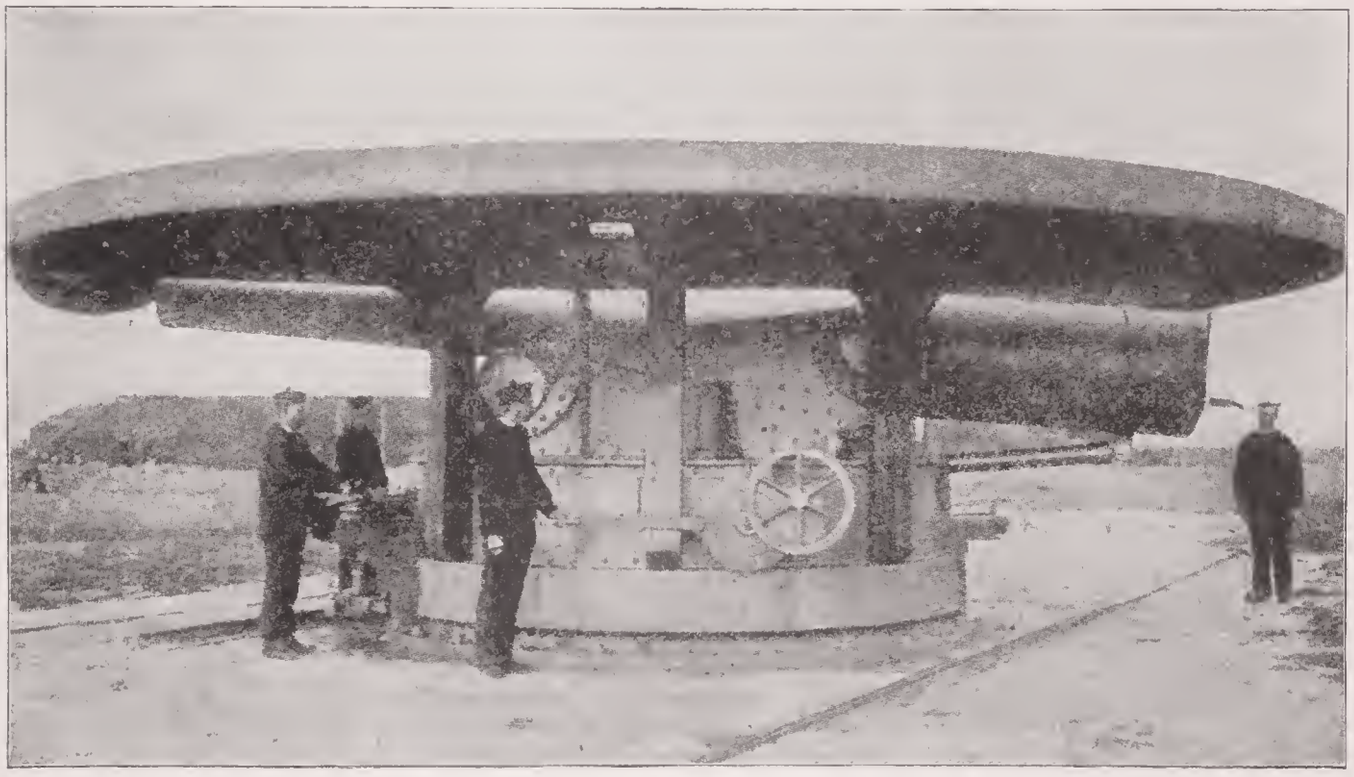
The colossal engines indicate 13,000 horse-power. A procession of 13,000 horses would be an impressive spectacle, if they were all of equal strength and were tugging at full capacity, trying to move one object. A "horse-power" is any power that can raise a weight of 33,000 pounds one foot high in one min-

ute. It will be seen how great is the force required to drive this monster through the waves.

It has the honor of being a scientific ship; that is, every part of it has been in the grasp of mathematics. Every detail of ship and machinery was subjected to computation by skilled mathematicians before a hand was raised to build it. For scientific men now know what they are about before they act. The cooking is done by electricity, and also the refrigeration. Ice for cooling is frozen by electrically actuated apparatus. This saves loading up with tons of ice in port. Complete ventilation is also secured by electricity. Each stateroom has electric communication with "central," and they are supplied with electric utensils, chafing dishes, heaters, etc.

The highest skill has been displayed to insure safety. It has quadruple expansion engines with double screws. And they are so arranged that "vibrations" are eliminated. The most elaborate system of water-tight chambers is installed, so that the ship would not sink, even if in collision. The news of the world appears in the daily papers, printed on board, as received by the "wireless."

As wonderful as this might appear to our Phoenician friend, there is another and equal wonder. It is the marvelous electric indicator to detect the approach of any other steamer, even in the densest fog. It seems endowed with intelligence —electro-magnetic intelligence—for if a ship enters its magnetic field, whose diameter is ten miles, the needle of the indicator turns and points in the exact direction of the intruder. More remarkable still, the revolutions of the screw



How the same gun as shown on page 153 can be lowered out of sight. The whole of the lower mechanism, as well as the gun itself, can be hidden in the earth and only raised for firing.

of the oncoming vessel are recorded. Collisions are almost impossible, unless with icebergs, and their proximity is known by means of sensitive thermographs.

The focus of the ship is on the bridge, and the officer in charge has knowledge of the great living creature and of adjacent space.

The length of this majestic triumph of human genius is 725 feet. Multiply 13,000 by 33,000 to find the number of pounds push required to move the marine monster.

And now a mighty fact stands out—enough radiant energy from the sun continuously falls on the deck of the Baltic, in absence of clouds—to run the engines, if it could be rescued from waste and changed to mechanical power.

The earth is 93,000,000 miles from the sun; and the surface of a sphere with this radius would afford room for two billion one hundred million worlds like ours, each of which would receive the same quantity of energy. Of all problems now confronting man, the one supreme in importance is to utilize the vast power now sinking into oblivion in the appalling deserts of frigid space.

Scarcely less in interest than the use of power direct from the sun is the adoption of high pressure alternating currents of electricity on railways. It is now a success in Germany, for the Union Electrical Society in Berlin has discarded low pressure continuous for high alternating on a standard gauge road. The possibilities in the use of electricity in this manner are so vast as to be almost beyond all computation or conjecture, and the mind is bewildered. The attention of the world will soon be attracted to this marvelous conquest of nature's most formidable agency.

LIFE-SAVING SERVICE OF THE UNITED STATES.

For administrative purposes, the seacoast and lake shores of the United States have been divided into twelve districts, each with its quota of life-saving stations, consequently a chosen corps from the entire organization represents a high order of discipline and ability.

The service is arduous day and night, as well as extra hazardous when the incident of a shipwreck calls for the saving of life in a storm. During the winter a constant patrol along the coast is maintained, the various life-saving crews going on guard detail for this patrol work in successive relays. The stations in the same coast territory are connected by telephone, so that when necessity arises one station may call another to its assistance or notify it of a vessel in distress that has been seen. Each of the twelve districts is under the command of a superintendent, and each life-saving station is commanded by a keeper. The former, though supposed to exercise but a general supervision, often personally assists in the work of rescue. Of their small number two have been drowned of late years, one has escaped that fate by the merest chance, and another has died of exposure.

The keeper of a life-saving station sweeps with his marine glass as much of

the coast as is within range, keeping an especially close watch in stormy weather. He is also in telephone touch with the keepers of nearby lighthouses, who at once notify him if they have espied a ship in distress. In the event that a rescue is necessary, the station keeper musters his crew, directs the work and personally serves alongside his men. The crews of some stations are engaged in fishing or boating business of their own, but are subject to call at any hour. At the more perilous points they are exclusively in the life-saving service.

A NOTABLE CREW.

The station at Evanston, Ill., on Lake Michigan, has a crew which, with the exception of the keeper, is composed exclusively of students of the Northwestern University, and this collegiate crew has so greatly distinguished itself for pluck and efficiency that every member wears the government gold medal awarded for bravery.

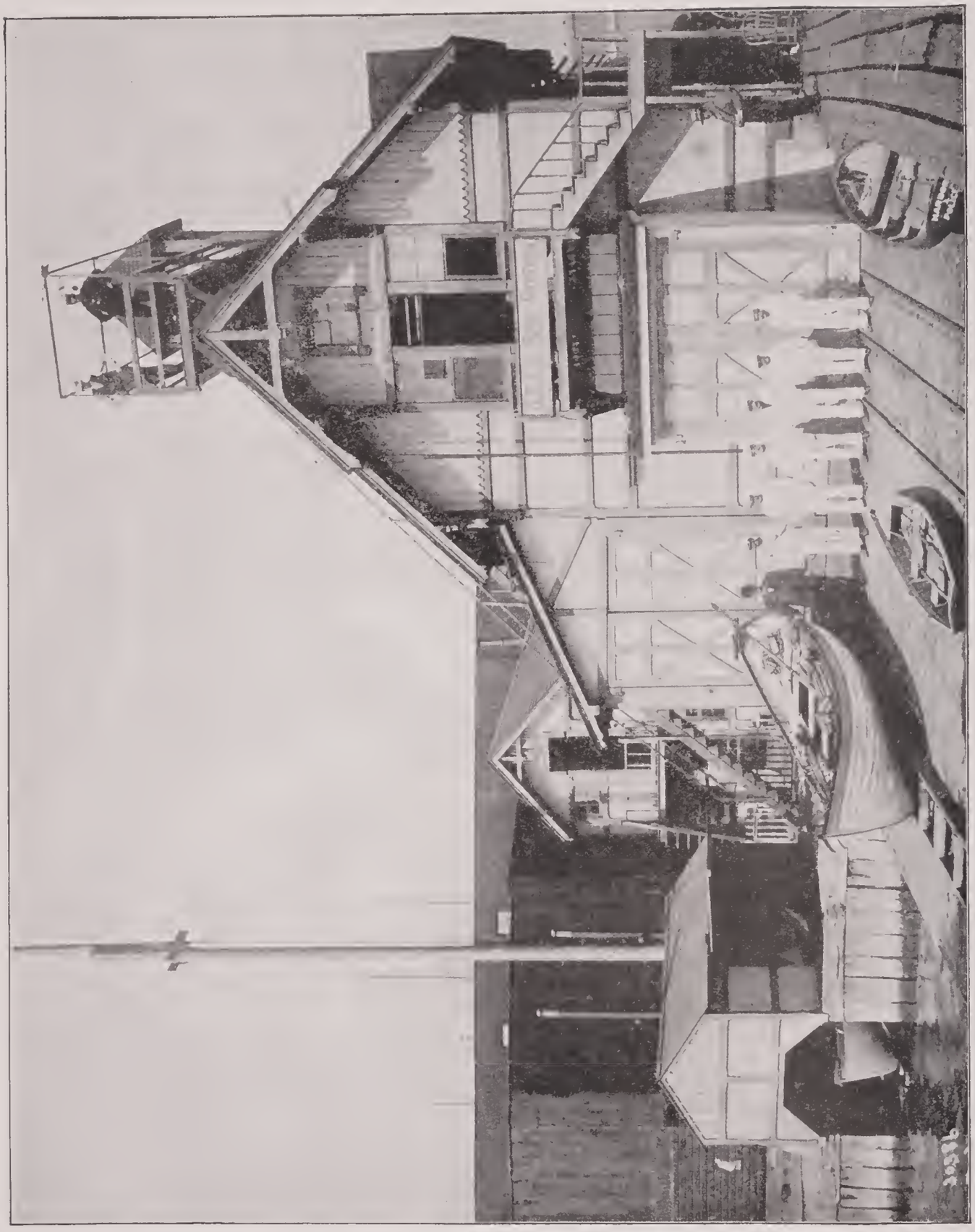
The rescuing of persons imperiled by shipwreck must be done in one of two ways, either by the life-saving crews going out to them in surf-boats or by firing a line to them from the Lyle gun, invented for that purpose, and then employing the breeches buoy to bring them ashore on the cable life-line thus made possible.

PERILOUS SERVICE.

The more perilous of the two, from the standpoint of the life-saving crews, is that in which the surf-boat is brought into service.

This is resorted to in cases where the firing of a life line to the distressed vessel is not practicable. The big surf-boat is hastened to the beach on a wagon constructed for that purpose. Its launching into the sea during a storm is a very dangerous task, requiring courage, strength and skill of unusual order. The members of the crew often range themselves on either side of the boat and force it out through the surf, springing into their appointed places at the proper moment, as best they can. Then begins the terrific hand-to-hand battle with the waves and wind, the master oarsmen bending themselves to the herculean task of sending their boat seaward in spite of the efforts of the gale and billows to hurl it back on shore, shattered and useless. The surf-boat is a mere cockle-shell opposed to the furious elements, but human skill, intelligence and courage are behind it and it is commonly the victor in such a contest, though there are many cases of failure and disaster attendant upon its launching. Once well out from the shore, however, the strain on the men and boat is comparatively relaxed.

More often than not, when a surf-boat has successfully made its way out to a vessel in distress the storm prevents its going directly to the side under the impulsion of the oars. In this case the boat is steadied some little distance away and a "heaving stick," with a line attached, is hurled to the deck of the ship. A heavier line is "bent on" to this light line by the ship's crew and drawn back to the surf-boat by the life savers, and the surf-boat is then cautiously warped up to the ship's side and the work of rescue begun. There have been instances where life-saving crews worked continuously for twenty-four hours at this perilous task.



Life-saving station showing design with slight variations of all the stations about the Great Lakes.

WHEN A SHIP IS GOING TO PIECES.

When a ship is going to pieces near the shore, the Lyle gun is brought into service. The gun-carriage, or "gun-cart," as the life savers call it, is run down to the water's edge and sometimes into the very surf itself. The gun used for this service carries a projectile to which a light-weight line is attached, the line being reeled up on another part of the carriage. It is here that the station keeper's gunnery counts, for he must so aim the gun that its projectile will pass directly over the endangered vessel, allowing the line to fall across the deck. Once this is done, a heavy cable soon stretches from the shore to the ship, and along this cable, by means of a machine operated by the life-saving crew, a "breeches buoy" is sent out to the rescue. The breeches buoy is simply a heavy leather contrivance into which the legs are slipped and from which it is impossible for one to fall. It is run to and fro along the cable, which, being swung from the crosstrees on the ship's mast, permits the buoy to be drawn shoreward, running along the life-line on a heavy pulley, with as little contact with the surf as is possible under storm conditions. In the cases of panic-stricken women or unconscious persons, the members of the life-saving crew bring them ashore, the rescuers using the "breeches buoy" and bearing the rescued in their arms.

SPECIAL FEATS OF INVENTION AND ENTERPRISE.

THE PYRHELIOPHORO.

The structure is of steel, an immense skeleton affair forty-two feet high, with a wing-like reflector of separate steel slats, each set with such mathematical accuracy that the slightest deviation of a curve may prove disastrous.

The machine sits on a true north and south line, and is built to resist any cyclone or electrical storm. It is so constructed that the reflecting gridiron may be adjusted at any time of day to meet the sun. The rays are concentrated from a reflecting area 6,170 times that of the heating surface, which is a small point, not more than six inches in diameter, in the upper centre of a steel crucible the size of an ordinary barrel, at the point of focus. This crucible is lined with magnesia, the plumbago previously used having proved inadequate in a temperature of 2,000 degrees centigrade, 3,632 degree Fahrenheit.

The problem of energy for practical uses will be solved when power can be taken from the sun from solar machines.

EXPLORING THE BOTTOM OF THE SEA.

What Galileo did in the way of exploring the heavens his fellow-countryman, Cavaliere Giuseppe Pino, is doing in the way of exploring the sea depths. In place of the telescope Signor Pino has invented the hydroscope, and by it the bottom of the sea can be examined with a clearness and ease which have hitherto been impossible.

The hydroscope is constructed of steel and in shape is like a huge telescope pointed downward into coral caverns or sunken ships instead of upward at the

sun or the stars. Its complex system of lenses, twelve in number, answers to the objective glass of a celestial telescope. Together with the internal mirrors they produce a very clear picture of the sea bottom, the rays of light passing up the tube to a sort of camera-obscure house at the top which floats above the surface and is capable of holding four people.

The amount of light under the surface is considerably greater than is generally imagined. The inventor of the hydroscope has himself been able to read a newspaper lying on the sea bottom at a depth of 300 feet from the surface by the ordinary daylight penetrating the water. The area viewed by the lenses at the bottom of the tube varies according to the amount of light. The water at the bottom of the sea is very often clearer than at the surface, as the sediment is capable of sinking in the still water, whereas at the surface sand and other matter is kept in solution by the constant movement of the waves, the force of which is not felt a very few feet beneath the surface.

The hydroscope is also likely to prove of very considerable use on war vessels. A tube can be fitted into the center of the vessel, one end of which will lead to the captain's bridge and the other will penetrate the bottom of the vessel and will have an extension portion which will be capable of being thrust out and drawn back as occasion requires, like a gigantic crab's eye. When the hydroscope lenses, which will be somewhat different to the apparatus illustrated here, are drawn up flush with the bottom of the vessel the water beneath the ship can be viewed to a distance of sixty to ninety feet. A private official trial of the hydroscope was made by the Italian government a few months ago in Portofino Harbor, where it proved very satisfactory.

One of the most romantic things yet accomplished by the hydroscope and the raising apparatus has been the bringing to the surface of an old Spanish galleon, one of a numerous fleet sunk in the Bay of Vigo in 1702 and recently brought to the surface by the aid of Pino's invention. In addition to this attempt on the old galleon some successful experiments were made with raising heavy boilers which had been sunk in the sea for ten years.

FULTON'S SYLPHON MOTOR.

A machine so sensitive to changes of temperature that it is able to generate power from the changes alone has been perfected after many efforts. The inventor is Professor Weston M. Fulton of the University of Tennessee. No matter how minute may be the change in temperature the machine is affected and power is generated and exerted or stored up, to be drawn upon as desired.

Professor Fulton has called his machine the Sylphon. It consists of an expansible and collapsible vessel. The wall is of thin sheet metal and the deep corrugations in it render it flexible, so that it may be drawn out or collapsed in a manner somewhat similar to the bellows of a camera. The end walls are thick and nonpliable. The vessel is generally made of steel, although brass and copper are useful in many instances. Simple as the apparatus may seem, it required years of costly experiment to reduce it to the

The hydroscope in the water. At the bottom are the lenses arranged round the steel tube.

efficient form in which it is now being introduced.

FILM OF STEEL CORRUGATED.

The process by which it is made requires seven distinct steps, involving principles of electrical engineering, mechanics and chemistry. By this process a cylindrical steel wall less than .005 of an inch in thickness can be corrugated and rendered so flexible that it can be expanded and collapsed thousands of times through a distance equal to its length without danger of rupture. Furthermore, this process makes it possible to construct this extremely thin steel wall free from soldered or brazed seams, so that it remains gas tight when drawn out or collapsed.

Chemicals sensitive to change in temperature are introduced, after which the vessel is hermetically sealed. As the chemicals expand and contract under the influence of temperature changes the vessel is thereby caused to elongate and collapse.

The kind of chemicals used in any case depends upon the special work which the device is intended to perform. The chemicals are partly liquid, but the active agents are gaseous. The superior value of gaseous bodies for heat-regulating and temperature-recording devices has long been recognized, but their use has been restricted because the expansible and collapsible chambers in which they were contained were made of rubber, leather or other materials which not only cause great loss of motion by yielding in all directions, but are really attacked by most gases and vapors and sooner or later destroyed by the chemical action.

USED TO FERMENT YEAST.

One illustration of the utility of the sylphon is found in a device which is used by the bakers in fermenting yeast. "Salt-rising" leaven requires a higher and more uniform temperature than hop yeast for its successful propagation, and for this reason artificial heat must be employed. This new apparatus automatically controls the temperature inside the fermenter.

Another illustration of the utility of the sylphon is where it serves as an automatic fire alarm and extinguisher. The sylphon under the influence of unusual heat acts on the circuit closer of an electric fire alarm, and at the same time turns on water.

The chemical used in this instance is a saturated vapor. The use of chemicals for this purpose permits of wide latitude in adjustment and it can be arranged to become active at almost any desired temperature. Hitherto it has been customary to employ a plug of fusible metal, which is introduced into the water pipes and which, when the temperature rises sufficiently, will melt and allow the water to escape.

Experiments show that the device furnishes a practical solution to the problem of winding clocks. A timepiece equipped with this device stores power by means of a weight or spring. The clock then needs occasional regulation, but never winding.

Professor Fulton, the inventor of the sylphon, is local forecaster in charge of the weather bureau offices and observatory at Knoxville, Tenn., and instructor of meteorology in the University of Ten-

nessee. He is also the inventor of an automatic river gauge, which has attracted considerable attention because of its ingenious features. This instrument has been adopted by the government for use at several observation stations.

GREATEST TELESCOPES IN THE WORLD.

The University of Chicago has an astronomical observatory near Williams Bay on Lake Geneva, Wisconsin, in which is the largest telescope in the world. The aperture of the lens is forty inches. The two lenses used in this instrument weigh 500 pounds and it required four years to complete the process of polishing them. The tube is sixty-five feet long and weighs twenty tons. The dome under which this is operated is ninety feet in diameter. Its great sections are moved with the touch of a finger by electric motors. The huge instrument and even the floor upon which it rests may be moved to adjust the telescope to any observation desired upon the heavens.

Accompanying this observatory is an immense photographic instrument consisting of a thirty-inch mirror mounted upon a horizontal telescope for the purpose of taking pictures of stars, nebulae and constellations. This astronomical machine is 165 feet long. The moon through this has a reflecting measurement of nineteen inches in diameter.

GREATEST MICROSCOPE IN THE WORLD.

The most powerful microscope in the world has recently been manufactured in Germany.

With it a man can go 100 times nearer the infinitely little than he has ever gone before. He can now probe the recesses of nature to a point which scientists have said was impossible. For years mathematicians have claimed that the present microscope could not be improved so far as showing little things is concerned, yet here come two German scientists with an instrument that proves mathematics an utterly unsafe ground on which to prophesy.

With the new microscope the atom becomes visible. Solutions that seemed absolutely clear to the highest-power instrument that had previously been trained upon them, now show galaxies of shining points comparable only to stars. Twisting and turning in the field of this microscope and shining with an ever-changing light, these particles have been admitted by every chemist who has seen them to be the fundamental forms in which the metals exist.

This microscope marks an advance second in importance to none of those which made the twentieth century famous for far-reaching delvings into natural phenomena. Now it is only a matter of eyes. The man who is best equipped by nature can see the most in this instrument, which stands at the very apex of optical perfection.

WONDERS OF THE INFINITESIMAL WORLD.

As a test of its profound powers, a solution of colloid gold was placed in a small cell with sides of finest rock crystal, through which a beam of light was passed. Then for the first time the true power of the new microscope became manifest. No dead and inert particles of

gold were seen, but a living, moving complex, glittering with light, ranging from the softest pink of Kunzite to the red and angry gleam of Mars, passed through the field. It did not move in a straight line, which would have given rise to the assumption that it was carried past the observer's eye by currents in the solution, but it took a beautiful spiral way, each separate entity pursuing a similar path, glittering and scintillating with light as the angles of this "molecular complex" caught and reflected the beam that made it visible. The form of the particles has not been definitely settled, but may be later deduced from the path and the points of light.

When silver or vanadium in colloid state was substituted for gold the path of these two elements was found to be utterly unlike that of the gold or of each other. The light with which they gleamed was also different, the silver showing blue rays where the gold showed pinks and reds. The silver solution is absolutely limpid to the unaided eye, while the gold and vanadium show faint traces of the colors which they exhibit under the microscope.

With this microscope, these metals, which are commonly considered as absolutely inert and devoid of all life are shown to be as truly living as the bacterium or any of the forms of animate matter in the ascending scale terminated by man.

With this new microscope far-reaching discoveries in germs are looked for. As it is now, the mode of examining bacteria is limited to "dead ones," which are made visible by staining them with aniline dyes. No staining is necessary with the new microscope, which reveals their inner structure in every smallest detail. The discoveries in this field of bacteriology may be of incalculable benefit to man by enabling him to better understand the conditions under which these enemies of his body have their being.

Taken as an instrument of research into all forms of infinitely little matter, whether of interest to the delver in the pure fields of science, where the discovery of the ultimate smallest particle is the goal, or in the applied science of medicine, it is predicted that no invention of the twentieth century's first decade may have more lasting impetus in the decades to come than this of Zsigmondy and Siedentopf, two scientific workers of the German host.

GREATEST ELEVATOR LIFT IN THE WORLD.

An elevator that will lift ships over a hill is an engineering wonder which has just been completed at Peterborough, Ont., as an aid to Canadian commerce. It is believed by many that it will give a new impetus to the projected plan of running a canal for Georgian bay straight through the heart of most productive Canada to Lake Ontario, thus making a short cut, which saves 250 miles, and which will incidentally rob Detroit of a large percentage of the shipping which now passes the city.

The complete success of this gigantic lift-lock, which is practically a huge elevator for lifting and lowering heavily

laden ships at a small expense from one waterway to another, adds a new importance to the Trent valley waterway, which owns this only elevator for ships on the American continent. By means of this new lock a barge or steamer can be lifted or lowered a distance of sixty-six feet under contemplation by the Canadian government. But while the distance from the bay to the lake, as the crow flies, is only seventy-five miles, in the narrowest part, and 200 miles by way of Peterborough and the Trent canal, many obstacles have faced the scheme.

Wonders of bridge construction. The Williamsburg or New East River bridge of New York City. View during the finishing work.

in one and a half minutes, while with the old style of lock, like those at Sault Ste. Marie, several hours are consumed in doing the same work.

For many years a canal from Georgian bay to Lake Ontario, through which ships might pass with western grain, has been

IS GREAT OBSTACLE.

Midway between Georgian bay and Lake Ontario the country is 600 feet above the level of the lake. To surmount this many of the old-style locks would have to be established at a stupendous cost, for with the ordinary lock a lift of

only twelve or fifteen feet can be secured. For the time abandoning the idea of carrying the Trent Valley canal through, the Canadian government turned its attention to another and much longer route. This contemplated canal route extended up the French river to Lake Nipissing, from there to the Ottawa river and down the Ottawa to the St. Lawrence. But this proposition also meant an immense expenditure of money, for the Canadian rivers, especially those with as swift currents as the Ottawa, afford at the best a dangerous waterway for ships.

For these reasons, many believe, the successful completion of the great lift-lock at Peterborough opens up new possibilities for the proposed canal across Ontario. From Peterborough almost to Lake Simcoe a series of a dozen or more lakes, together with short canals, have already opened up a rich tract of farming country, so that more than half of the proposed route is now navigable, while only four or five miles of canal is necessary to join Lake Simcoe with the waterway, when Georgian bay may be reached by means of the Severn river. Of the distance that remains, however, about twenty miles will have to be canals and in these there necessarily will be tremendous lifts for ships.

LOSS OF TIME SLIGHT.

With the ship elevators wherever locks were necessary no great amount of time would be lost in changing vessels from one waterway to another. In fact, as it takes only about twelve minutes for the complete change of a vessel at Peterborough, five separate locks would mean a loss of only about one hour. If vessels passed through the canal at a speed of six miles an hour it would take them in the neighborhood of thirty-five hours to make the trip to Lake Ontario.

On the other hand, it would take vessels sailing down by the old route, at a speed of ten miles an hour, fifty-five hours to get to the same point—that is, if they were not compelled to lose time in passing through the Welland canal, which joins Lake Erie with Lake Ontario. But at this point they do lose time, and a great deal of it. If the canal is clear, a boat may pass through this distance of twenty-six miles in twelve hours, so that in reality it takes a ship traveling at the rate of ten miles an hour in open water, just sixty-seven hours to cover a course that would be shortened to thirty-five hours by means of the proposed Ontario canal—a saving of thirty-two hours.

This Peterborough lift-lock is to the ship captain and his charge just what the elevator is to people in ordinary business life. Heretofore ships have practically climbed up and down stairs, as in the locks at Sault Ste. Marie. For instance, a ship enters a lock or basin. This basin is then filled with water, and the raising of the surface of the water lifts the ship until the lock gate can be opened, and the vessel can travel into the next lock. During half an hour or more a ship can be lifted about twelve feet in this way.

WHAT INVENTION IS LIKE.

But in the case of Peterborough ship elevator the vessel runs into a filled basin, the gates are closed, and in one and a half minutes the ship has been elevated or lowered a distance of sixty-six feet.

The wonderful engineering invention that performs this task is like a gigantic scales and an elevator combined. The first thing that strikes one when he looks upon it is its resemblance to a huge steel yard. The elevators, or pans, into which the ship runs, are two great steel boxes, each one capable of holding a vessel 150 feet long and thirty-eight feet wide. Each of these pans is supported by a huge steel arm, or piston five feet in diameter. Now, imagining both pans filled with water, they would absolutely balance between the massive cement towers which act as the framework of the scales. But they are not wanted to balance, so a little hydraulic pressure forces up one of the piston arms, and one of the tanks is held at the upper canal, while the other is at the lower canal, sixty-six feet below.

Now along comes a ship. This vessel, it may be, is to be lifted instead of lowered. From the lower canal it glides into the big tank, and the gates are closed behind it. Then the lockmaster, who watches everything from one of the cement towers, "rings to the elevator boy." This assistant, nearly 100 feet below, touches a lever.

HOW VESSEL IS RAISED.

Immediately the weight of the water-filled tank at the upper canal tends to pull up the vessel in the other pan of the scale. But, of course, its weight is not sufficient, inasmuch as there is the added weight of the ship in the other side. So hydraulic pressure is brought to bear against the piston of the ship-laden tank—a force pushing up, while the water-filled tank above acts as a weight coming down. In about one and a half minutes the vessel is on a level with the upper canal when the water-tight gates of both canal and lock are opened.

As the big steel cup which has brought up the ship is already filled with water, there is no rushing of a torrent into it when the gates are opened, and the vessel glides quietly out and on her way. If all has gone well, no more than twelve minutes have elapsed during the change of waterways. When a vessel is lowered, practically the same work is done over again, only in this instance the hydraulic pressure is added to the side that is coming down, so that the ship will not fall too rapidly.

The entire working of the gigantic mechanism is absolutely noiseless, and the sight of a large ship being raised or lowered a distance of more than sixty feet, without jar, tremor, or grating, is almost awesome. Each day now, hundreds of people are flocking to see the famous invention at work.

Even if the huge ship-elevator is not seen at work, it is worth one's visit to look upon the world's largest mass of concrete. The side towers are 114 feet high, and a public roadway passes through the huge base that supports the canal above, and in which are more than 25,000 yards of concrete.

A RADIUM CLOCK THAT WILL RUN FOR THIRTY THOUSAND YEARS.

A radium clock, which will keep time indefinitely, has been constructed by Harrison Martindale, of England. The principle of this apparatus is simplicity itself, the registration of time being made in two-minute beats, while its function is to

exhibit the dissipation of negatively charged alpha beta rays of radium.

The clock, according to the Scientific American, comprises a small tube in which is placed a minute quantity of radium supported in an exhausted glass vessel by a quartz rod.

To the lower end of this wonderful little tube, which is colored violet by the action of the radium, an electroscope formed of two long leaves or strips of silver is attached. A charge of electricity in which there are no beta rays is transmitted through the activity of the radium into the leaves, and the latter thereby expand until they touch the sides of the vessel, connected to earth by wires, which instantly conduct the electric charge, and the leaves fall together.

This very simple operation is repeated incessantly every two minutes until the radium is exhausted, which in this instance it is computed will occupy thirty thousand years.

THE WIRELESS TELEPHONE.

Professor Marjoram, inventor of the wireless telephone, describes its work.

I am asked to explain in "popular" language my wireless telephone, by which messages have been sent between points seventeen miles apart. To give an idea of the basis of my invention, let me refer to the wireless telegraph. It is known that with the Marconi system when a spark is discharged at the transmitting station there are heard in the detector sounds corresponding to each spark discharge. The detector, as is known, was invented by Marconi for this purpose, the telegrapher listening to the sound of the sparks being able to decipher the telegram. Ordinarily the number of sparks that are discharged by the Marconi apparatus is not more than ten per second at a maximum.

This limit is sufficient for the purposes of telegraphic transmission, but it was necessary for my purpose to obtain a great increase over this. With this in view I commenced by enormously increasing this number, and I soon succeeded in discharging as many as 10,000 a second, each discharge being much weaker than that adopted in telegraphy. This being the case, whoever is present at the detector hears nothing, since the sparks succeed each other with extreme rapidity and are all of equal intensity.

If, however, by means of some arrangement the intensity of the sparks is changed, and if these variations are caused by and correspond to the vibrations of the living voice of a person who is speaking, the words will be faithfully reproduced at the detector. The question thus is to modulate the series of sparks, making them now shorter, now longer, under the action of the words. I have conceived many devices for this purpose, and at present am working on a special microphone which I hope soon to introduce to the public.

If the invention should prove of practical use, there is no reason why it should not supersede the wireless telegraph, in many instances, especially when the distance is not over seventy-five miles. It is not permitted at present to speak of greater distances, but one would have the advantage of obtaining a rapidity of transmission ten times greater than with the wireless telegraph, the human words

developing much more rapidly than the telegraphic sign.

TYPESETTING BY MACHINES.

Typesetting was, until twenty years ago, an occupation of tedious labor that required every detail in composition to be performed by hand. Not only was the composition done by hand work, but the distribution of the individual types back into their respective cases by hand was

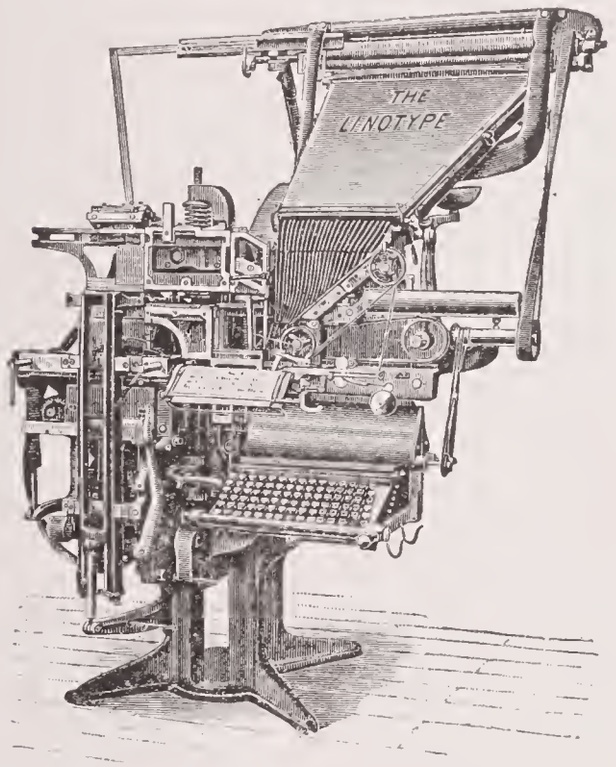


Fig. 1. The linotype.

an associated function in every printing office. Machines for setting type have now reached that stage of perfection where the old, hand-setting method will be in a very short time entirely eliminated from even the smallest printing offices. The advantages of typesetting by machinery are so numerous that a comparison between the two methods is hardly possible. The principal features that recommend the machine are: that it can duplicate the work of eight men in the same amount of time; that it requires no distribution after printing, as the machine type or slugs are melted over again; that clear impressions are obtained, as the type is always new.

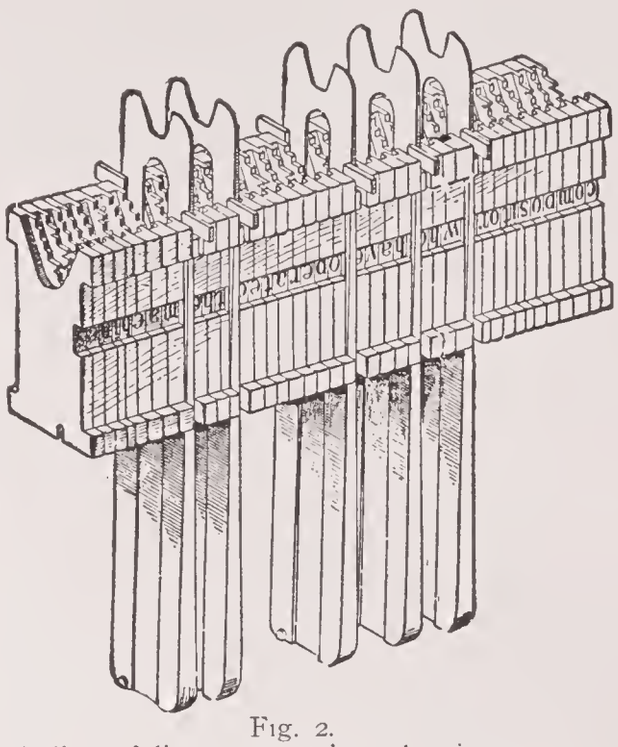


Fig. 2.
A line of linotype matrices showing spacers

THE MONOTYPE.

Wonders of the typesetting machine.

The Monotype is a book and job type-making and composing machine.

Working automatically it casts and finishes foundry type, sets, justifies, and delivers it on the galley ready for proving.

It passes with ease from straight composition, to tabular and other intricate work.

It carries at one time five alphabets (225 characters), upper and lower case, Roman and italic, small caps, figures, and punctuation marks for each, accents, diphthongs, as well as all the signs in general use.

With it every job is set in freshly cast, individual types—which equal in quality the very best output of the leading foundries.

KILLING WHALES.

The whaling industry is only about six years old, as an "industry"; a most lucrative one it is now. Whales are now killed by steam, the steamer carrying a gun, which projects a huge barb and line, where before the harpoon was used. Thirty steamers are now engaged in the business, and a thousand whales annually will shortly be the annual kill, we are informed. The whale's carcass, towed placidly into port, is turned over to a dual factory system—oil-makers and fertilizer makers. Every oil-bearing portion of the body is boiled till it yields the last drop; then the residue of waste, together with the non-oil-bearing portions, is conveyed to the fertilizer makers. The latter's product, it will be news to many of us, is chiefly shipped to the Southern States, the bone phosphates being highly valuable for enriching farm lands.

HOW WHALES ARE HANDLED.

In this realm of machinery we marvel at the crude methods employed in handling the whale carcass. A giant crane is almost the only machine aid used. The blubber is removed from the exterior of the carcass with hand knives. The material is carried from one place to another, from one "factory" to another, in wheelbarrows. Immediately the suggestion occurs to us that a track and cars would be easier and cheaper, or that a pulley device would increase economy.

The "whale" in the natural history exhibit of the Government Museum at Washington is the result of the energies of the Museum Commission. In 1903 the museum sent a party of scientists to the Newfoundland whale factory to secure a complete plaster mold of one of the monster sea mammals. A bull seventy-eight feet long was taken, from which the papier-mache model was made. After the flesh had been removed from the carcass the scientists purchased the skeleton, which is exhibited beside the cast. Pieces of the skin, preserved in formalin, so as to reproduce the markings and colorations of the body, are used. The cost of this single exhibit is said to be about $7,000.

NATURAL HISTORY OF THE WHALE.

To the few who are naturalists the whale has additional abundant interest. Those of us who are not, being in the vast majority, may learn that the bulky monsters of the deep are not fish, but are "animals," mammals, related to hoofed

creatures which, in remote ages, adopted aquatic life, first in fresh water, then in salt. The conditions under which they lived during these countless aeons are, so the scientists tell us, responsible for their fish-like form, which is not a mark of relationship to the "finny tribe," the whale's fins being only remnants of feet. Whales, by the way, suckle their young as cows do calves.

COLOSSAL ENGINES.

A great engine and its generator standing under a seventy-foot roof, do not always appear to their full advantage. It is when one sits down and watches the twenty-five foot flywheel move almost silently, making seventy-five revolutions a minute, that one begins to appreciate the immensity of the machine and understand that the indicated horsepower probably is real. Its possible capacity, worked at full speed and under full pressure, is 8,000 horsepower.

The engine of the Manhattan type is named after those which produce the current for the electric trains on the elevated railroad at New York.

BEWILDERING DIMENSIONS.

Some of the dimensions of the giant Manhattan machine when set down on paper give a better idea of its immensity. The flywheel alone weighs 300,000 pounds, the rim having a face of 30 inches and depth of 33 inches. At ordinary speed the rim travels considerably more than a mile a minute, and does this day and night. The shaft weighs 30½ tons and the crank 16 tons. The engine stands exactly 39 feet 2 inches above the floor. The entire engine weighs 1,440,000 pounds and the revolving parts, including the generator, 514,000 pounds. The stator yoke of the generator, which is 27 feet in diameter, 33 feet over all, weighs 58,000 pounds. The stroke of the giant piston rods is 5 feet. The high pressure cylinder is 44 inches in diameter and the low pressure cylinder is 7 feet 10 inches in diameter.

THE MAGICAL BUTTON.

On one side of this little cage—the attendant calls it a rheostat—is an arm which is turned by a tiny electric motor. Its business is to cut out the resistance of the rheostat and let the current flow through the wires.

Near by is a diminutive turbine engine that attracts much attention. The turbine is something new. This particular one is of the newest make. It is 500 horsepower, but does not begin to look it. The engine occupies about the space that a grand piano requires—a little longer and not nearly so wide. The shaft is attached directly to an electric generator. The speed, 3,600 revolutions a minute, is beyond ordinary comprehension. There is no vibration and little sound save a low, tense, insistent hum. The engine has been running at the same speed for nearly a year.

There is another great machine known as the welded steel "digester," used in the manufacture of paper. It is 9 feet in diameter and its total length is 42 feet 6 inches. It weighs 41,300 pounds.

There is a planing machine which smooths down a piece of iron or steel eight feet wide and twenty feet long as

if it were so much white pine. Near by is a gigantic "guillotine" shears, made to cut boiler plate up to a quarter inch in thickness. It cuts with as much ease as a tinsmith would cut the thinnest sheet iron, the trimmed off narrow strips of metal becoming smoking hot with the process and curling amazingly.

FOR BORING STEEL.

There is a boring machine capable of boring in steel a hole any size from a quarter of an inch up to seven feet. Its planer is ten feet wide, and a five-thousand-pound steam hammer is part of the equipment. The entire machine weighs 385,000 pounds.

It is refreshing, after seeing engines and other "largest in the world" machines, to turn to the little things. Possibly one of the most interesting is an atomatic pinion cutter. From the end of a tempered steel wire the machine cuts away about a quarter of an inch, after having polished and shaped it to some extent. Then the gearing is cut with mathematical precision, a stream of oil all the while helping to keep it cool. At the end of a minute and a half of ruminative work the machine stolidly drops the highly finished pinion in the stream of oil, and, without further preliminary, attacks the end of the steel wire again. The machine is capable, it is declared, of running all the time. It covers less than a square foot of space and is barely ten inches high, hardly as large as an ordinary typewriter, but is held at $1,500.

One clever inventor has found a real use for hot air. This man makes superheated atmosphere do all sorts of light work, but especially applies his invention to lifting water from wells and springs. There is no boiler, none of the usual requirements of an engine except fire, and that may be supplied by anything combustible, from natural gas to pine knots. The fire once started, the engine is soon going, and there is no stopping it unless something breaks or the fire goes out.

MACHINE FOR MAGNIFYING TIME.

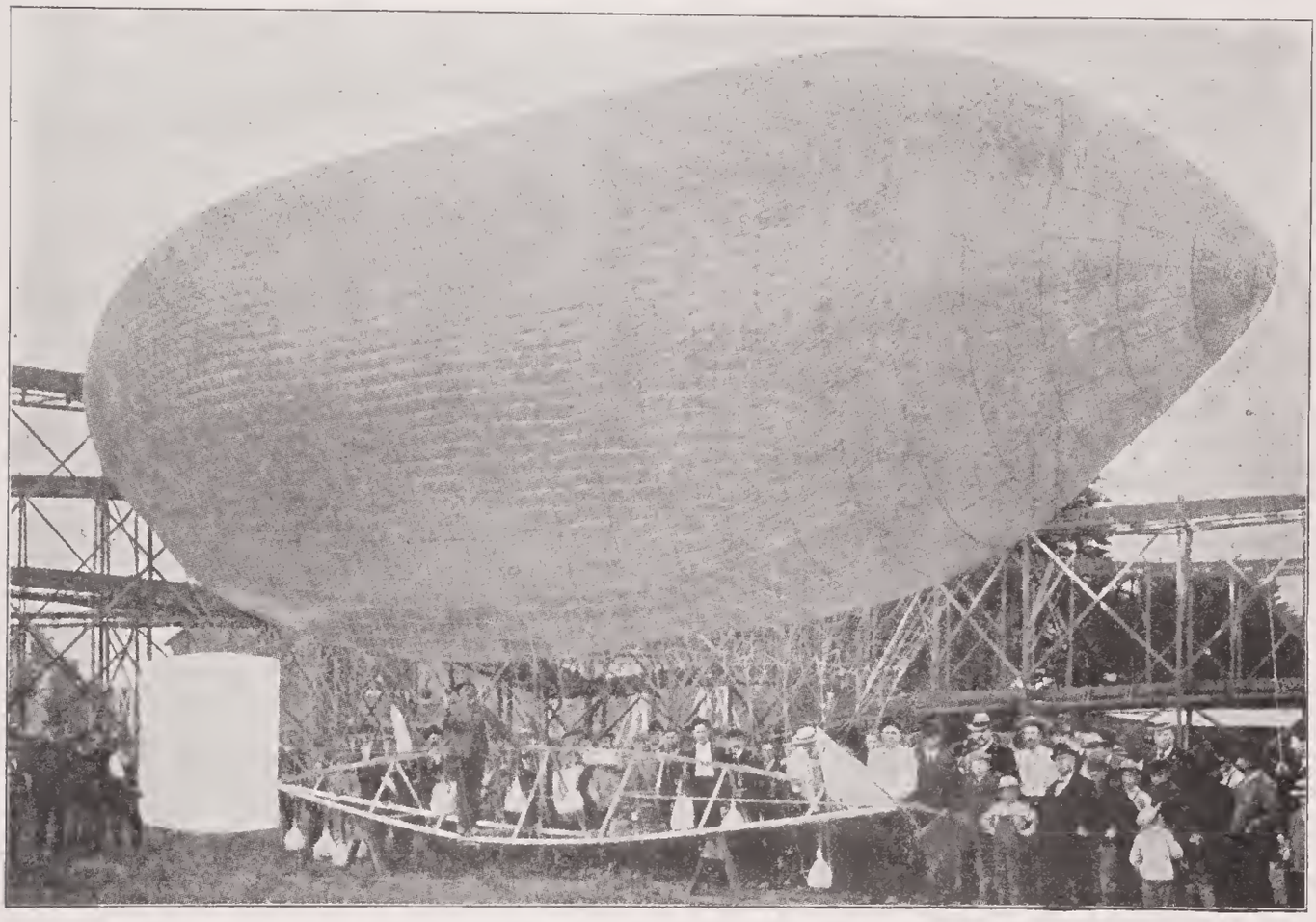
"A machine for magnifying time" is the misleading name given to a new electrical invention which makes it possible to observe rapidly moving wheels and other parts of machines more clearly. By its means one may watch the stitch of a sewing machine and see exactly how it is made, or observe the flying spokes of a bicycle wheel, which, to the naked eye, would appear but a filmy spider's web, and note exactly the vibrations and strains. The machine that produces this result is simple once the principle is clearly understood. By means of electric sparks fired at rapid intervals the machine is illuminated. If the flashes coincide exactly with the revolutions of the machine they will show it always in one position, and the machine will seem at rest. By slightly retarding the flashes so that they lag behind their time the machine under observation will seem to move slowly. This is because at each revolution the machine is shown at a slightly later stage. The machine is called the stroboscope, and will prove of great use in studying the effects of rapid motion.

HOW SHOES ARE MADE.

Few realize that 170 separate and distinct steps are required for the manufacture of our footwear, or that seventy different machines, many of them marvels of ingenuity, are used in the process. Fewer realize that the seventy machines can be manipulated by skillful shoeworkers so rapidly that the 170 stages are passed through in twenty minutes. From raw leather to a first-class or "welt" shoe in twenty minutes!

The "miracles" performed in the shoe business are not a whit more wonderful than the daily round in any other great industrial business—the making of the newspaper, for instance.

But the shoeman is so busy with his shoes that it all becomes ordinary to him, and the newspaper worker sees his business in the same way, and all other workers look at their particular work the same way. So, if we would see genuine up-to-date miracles performed, we but have to lift our noses from our own grindstone and do the often odious thing of poking them into the other fellow's business.



The Baldwin airship prepared for flight.

In passing from stage to stage, a shoe rests for a time upon racks between processes because after the several wettings of the leather it is desirable to allow it to dry. Thirty days is the average for a

shoe to remain in factory. But the raw leather is being cut continually at the exhibit and far at the other end of the line, shoes are being turned out constantly in working hours, the rate being 300 a day.

The changes have no effect upon the "story of the shoe," as told by the exhibit; the details of the manufacture are the same in any case. An entire recital of the 170 specific incidents in the history of a shoe would involve many details only confusing to one who is not a "shoe man."

THE PROCESS OF MAKING SHOES.

These are the essential steps:

The cutter cuts the leather, following patterns, of which he has quite a number, fitted to styles and sizes. He stands at a board much as a tailor, but does nothing all day long save slice out the various pieces of shoes.

After the cutting comes the stitching, which is simply the sewing necessary to the making of the "upper." The work usually is done by girls, who sit at sewing machines of peculiar construction and who, if skillful, work with surprising rapidity.

The "upper," fresh from "stitching," goes to the "making-room," where the "eyelets"—holes for the laces—are put in. Then the "upper" is drawn over a "last" and the "insole" is put on. Special men are assigned to the cutting of these insoles, and a supply is always in readiness.

Then, following the career of a shoe, we are taken to the "pulling-over machine," a device that draws the upper firmly down over the last. Next is the "niggerhead lasting machine," which finishes the work of the "pulling-over machine," seizing the lower edges of the upper, binding them more securely to the last and tacking them to the insole.

Now we are introduced to the "inseamer," which in some mysterious way gouges around the outer edge of the insole, creating a protruding flap of leather that at the same time is sewn to the "welt." This welt is what appears as the upper facing of a spread-sole shoe, but it is not a thickness of sole, merely a thin strip of leather around the outer edge of the sole, which fixes the upper firmly to the insole.

Then the "shank," a strip of steel at the instep, is put in by hand; the edges of "welt" and "upper" are trimmed, and the bottom of the shoe rendered even by a filling of cork and glue. The shoe is ready for the outer sole, which will have been "channeled" much as the inseamer channels the insole. A stitching machine which sews hot, waxed thread with interlocking stitch, attaches the outer sole by sewing through the welt. By using the heated wax, the thread when cool becomes as if a part of the leather, and, though wear may destroy the lower loops of the stitches, the outer sole is not detached.

Even at this point, your shoe is not complete. The sole must be "leveled" to the form of the last; all the processes of "heeling" are yet to come; and there are many necessary steps such as "trimming," "polishing," "stamping," etc.

INGENUITY OF THE MACHINES.

Almost any one of the machines represents the mechanical endeavor and progress of one, two or three generations.

They are remarkable at once for their ugliness, their seeming complexity, and the rapidity and accuracy with which each performs its task. The one with the extraordinary name, the "niggerhead lasting machine," perhaps is the most interesting of all.

It came to possess that striking title in the parlance of shoe workers because of its inventor, who was a South African mulatto. Like many an original mechanic, he became convinced that machinery could be made to do what many better educated, or scientific men deemed impossible. Then when it appeared that after all something was in his claims, efforts were made to steal his invention. At that time, it is said, the first "niggerhead lasting machine" lay concealed for three years in a haystack.

Let that be as it may, improved and to an extent simplified, the machine now does the work of four men. Its essential parts are contained within an eighteen-inch thickness, a space of a shape resembling a human head. Peculiar nippers slip down and grip the "upper," draw it tightly over the last, and then a needle, worked from somewhere in the depths of the mechanism, stitches around the circumference of the insole so rapidly that the eye utterly fails to follow its in-and-out movement.

DESERTS BLOSSOMING AS THE ROSE.

GOVERNMENT ENGINEERS CREATING GARDENS IN THE ARID SOUTHWEST.

It is a wonderful transformation that will be made in the far southwest if the plans of the United States geological survey with regard to irrigation are carried out. Ever since the passage of the new irrigation act the survey's engineers have gone throughout this part of the country, making surveys and reconnoitering the rivers and possible dam sites for storage reservoirs. These men have just left for the northwest to return to this arid desert in the fall, says the Phœnix correspondent of the Boston Transcript.

Millions of acres in southern Arizona alone will be reclaimed and reduced to wonderful fertility if their plans are carried through and their success seems sure. A single project in this territory calls for the irrigation of 400,000 acres. while there are several amounting to more than 100,000 acres each. Not very much, the biggest of them, compared with the immense areas that now lie under the scorching and burning sun, but capable of supporting a vast population. Irrigable lands in the southwest are not like farming districts elsewhere. A few acres can be so intensely cultivated that they will yield a greater return than ten times as many elsewhere, and with less risk of loss from a capricious climate. On these lands seven crops of alfalfa hay can be gathered in a single year, with other yields proportionately as great. These lands are very rich. They will grow almost anything except corn, which does not adapt itself readily to irrigation and the baking soils.

WATER FROM THE COLORADO.

The largest project in this region is that of the southern Colorado, north of

Yuma, where engineers have been working until recently. The Colorado is a great river, with abundant water all the year through, and after it passes its deep canyons it flows through a region where the water can be easily guided over the plains. It is expected that within four or five years the lower Colorado will water not much less than half a million acres that now lie worthless under the hottest sky in the United States. Most of this land is not like the average American desert—that is, a plain covered during the springtime with flowers and at all seasons with sagebrush, greasewood and kindred vegetation—but is as bare as the lands of Egypt above the reach of the Nile, and there are no such tenantless deserts in the world as those. But half a million acres of the lower Colorado, once watered, will support in comfort and even in abundance, more than 10,000 families. Estimates of the cost of this work have not been completed, but it is not expected that the cost of this land with perpetual water rights will be nearly as great as that of breaking and subduing a similar tract in the forest states of the central west, say Minnesota or Wisconsin, while the crops will be far greater and their value many times as high.

PROJECTS UNDER WAY.

A little distance west of the Colorado, in southern California, one water company has been irrigating by means of an immense dam for some years and is growing rich from its income from farms under its water privilege. The government is investigating this Elcajon valley with a view to increasing the improvement and adding vastly to the reclaimed lands. As under the national projects the lands will return no continuous income of great profit, the private company now located there is fighting the project with all the means at its command, but is scarcely likely to succeed in blocking an improvement that means millions for the region and for the little city of San Diego.

On the San Pedro river, in southwestern Arizona, the government engineers have been at work for a year and have completed the survey of a project of the utmost importance. This will irrigate more than 300,000 acres now useless. The wonderful fertility of this soil has been shown by the numerous little ranches that have been established along the river and that supply many of the mining camps of southern Arizona with their vegetables, fruit, forage and milk. But these individual efforts are necessarily of small consequence and the area that they can cover is very restricted. With this project completed the score of little toy ranches that now dot the San Pedro valley above Tombstone will be replaced by a belt of fertile farms as wide as the valley itself and miles in length.

INTRICATE ENGINEERING PROBLEM.

This irrigation project combines with the erection of dams and the construction of main and lateral canals an engineering problem of a more intricate and rather unusual nature. This is nothing less than the relocation of a main line standard gauge railway for thirty miles through the mountains and the reconstruction of that road for that distance in a substantial and permanent manner.

Process of constructing the First National Bank building of Chicago.

This the government has undertaken to do, and it will turn over the new road to the El Paso & Southwestern system free from all debt and incumbrance, well ballasted, laid with heavy rails, and complete in every detail, even to the erection of water tanks, station houses and sidings. This portion of the San Pedro project alone will cost about half a million dollars. The El Paso & Southwestern road belongs to that famous New York firm of western organizers and copper miners, Phelps, Dodge & Co., and was built by them a few years ago to serve their mines in the far southwest. It was built through the San Pedro valley, and its present track will be under water for thirty miles when the proposed dam is completed.

TONTO BASIN DAM.

Work is already well under way on the so-called Tonto basin dam, near Phœnix, on the Gila river, which is to irrigate about 250,000 acres and which is to cost more than $3,000,000. The government is erecting at the new boom town of Roosevelt immense cement-making works. Fortunately, a rock suitable for the making of concrete was discovered in the immediate region of the proposed dam, and it is estimated that by making its own concrete the government will save at least $4 a barrel on the scores of thousands of barrels to be used in the dam. Concrete firms in the central west, Kansas and elsewhere thought there was no opportunity for any competition and charged high prices, the railroads wanted as much more in freights, but the government cut the knot into which the entire project was being tied by the construction of its own works.

This is the first actual construction under the national irrigation laws passed by the recent congress. As such it is of double interest and importance. The thorough manner in which the government undertakes its constructions of magnitude is well exemplified here. Already 500 men are at work, all on preliminaries, for the dam has not yet started, nor has the canal which is to convey the water to be impounded. But there is a great concrete works and a large and powerful electric-light plant to furnish illumination for night work, as the construction is to be continued day and night once it is begun. Then there are waterworks systems, hospitals and the like, and a railroad to connect the site with the Santa Fe road, wagon roads through the mountains and a great power canal that will furnish all power for the actual construction of the works.

GOVERNMENT SCHEMES.

The government is at work all over the far west and is making plans for the development of millions on millions of acres that now are utterly worthless. In addition to the work in the southwest, in Arizona, New Mexico, California and western Kansas, the engineers are scattered over Idaho, Montana and Washington, as well as in the interior states of Utah, Nevada and Wyoming. In Utah there is little opportunity, so well have the Mormons covered the hillsides with their irrigation ditches and the valleys with their fields, laughing with fat crops. But in all the remaining region there are enormous possibilities; these are indeed so great that it is impossible to estimate what they may lead to. It is only the question of a sufficiency of water

that will limit the activity of the geological survey. One of the greatest of all projects yet considered is that of the Snake river in Idaho, and the Columbia will furnish a vast flood to make glad the deserts of central Washington.

Under the act authorizing this work all proceeds of the sale of government lands are set aside for a fund for the improvement of such other government lands as surveys may show to be adapted to irrigation. So there is no direct charge upon the public. As soon as the irrigation projects are carried through and the lands are ready for sale the government will sell them at a price that will pay for the original land and the improvement and will add enough to the cost to maintain a permanent supervision and repair fund, so that the buyer of government land under an irrigation ditch will pay only one cost and will have water forever. The plan is far-reaching in its effect and is so wise in its possibilities as to seem beyond the capabilities of any of the political leaders of today.

TO POPULATE DESERTS.

THE SALVATION ARMY'S VAST PROJECT—WHAT IT HAS DONE ALREADY.

Officers of the Salvation Army, which is now holding its international congress in London, have evolved a stupendous plan of populating the arid regions of the West. They have a scheme to remove the pauperized classes from the great cities and make them farmers. They want the government to advance the money for a colonization scheme more ambitious than any which the great colonizing countries of Europe have ever yet attempted. They had a bill introduced at the last Congress to carry out their scheme, and although the bill was killed and the plan called a chimera, they are now lining up to fight it through at the next session.

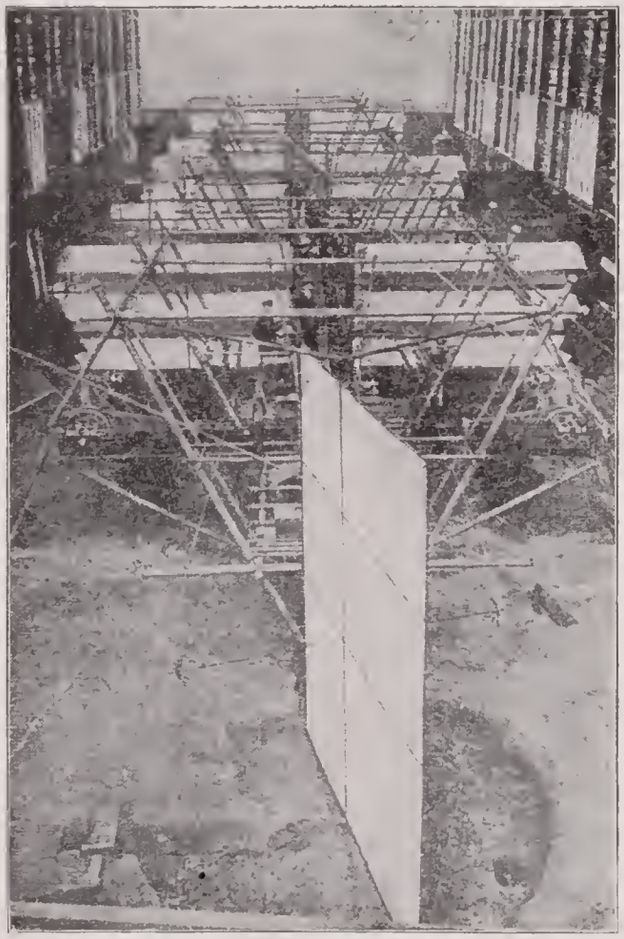
The Salvationists have figured it all out. There is enough waste water in the United States, they say, to irrigate one-fifth of the arid lands, or 150,000,000 acres, and of this vast territory, only one-fiftieth, or about 10,000,000 acres, have already been reclaimed. They estimate that the government can settle families on fifteen-acre tracts at the cost of $27.50 an acre, and in the bill which they want passed Uncle Sam is to loan out $5,000,000 a year to reclaim annually nearly 200,000 acres. This would remove from the cities every year, they estimate, more than 10,000 families, or about 50,000 souls. Such a project would not only pay for itself, its advocates say, but also net a rich income. The money is all to be paid back at 6 per cent interest.

SUCCESS SO FAR ACHIEVED.

Whenever the Salvation officers are called visionary in advocating such a plan they point to the three colonies which they have themselves established in Colorado, Ohio and California. These settlements, aggregating about five hundred men, women and children, have cost about $300,000, but their founders say that all except the youngest are now self-supporting.

The oldest and largest colony and the

one that best illustrates the settlement plan, which the army wants the government to undertake, is at Amity, Col., a few miles west of the Kansas line, on the Santa Fe Railroad. Here six years ago two thousand acres were purchased for $44,000, and at the present time one-half the land has been taken up, and the community has grown to a population of 360.



General view of the mechanism below the balloon of the Barton airship.

Its people have prospered, according to Commander Booth-Tucker, who said recently that the freight alone on Fort Amity's crops last year amounted to $50,000, or $6,000 more than the original cost of the land. Of the $110,000 expended on the colony for land, buildings and irrigation works, the colonists have paid back nearly one-fourth, or $27,000.

As each family arrives at Fort Amity, it is quartered by the commanding officer until its house is built and furnished. If the newcomer is "handy with the hammer" he builds his own house; if not, he hires the village carpenter. Besides the home, the settler obtains two horses, a cow, two dozen chickens, and all the tools needed for cultivating his twenty acres of land. He is also supplied with cash to buy the seed for his first crop, after which he is supposed to shift for himself. His chief crops are alfalfa, cantaloupe and sugar beet. By the time the first crop is harvested, however, he is in debt to the army for from $1,000 to $1,500. He has eleven years to pay back the sum, and inasmuch as the interest is accumulating right along at the rate of 6 per cent, he is stimulated to cancel his debt as soon as possible. Commander Booth-Tucker says that a few have already cleared themselves and adds: "Families who started two to five years ago with nothing now possess farms worth from $2,000 to $5,000. The average cash income of the settlers is $800, and there is no disposition manifested on the part of any of them to abandon their farms and return to the city."

GREAT VALUE OF IRRIGATION.

The vital importance of the irrigation ditch is seen in every deed of property drawn up for reclaimed Western land. At Fort Amity each colonist is entitled to certain water rights, so that he can flood his land for each crop, at the cost of 20 cents a year for each acre. The entire Arkansas Valley, at the eastern end of which Fort Amity is situated, is supplied by a vast irrigation system, which

is the largest in the United States, consisting of five great reservoirs, with a capacity of 14,500,000,000 cubic feet, and seven canals, which all told are 315 miles long. This supply is sufficient to irrigate 150,000 acres. The entire valley is made accessible to the markets of the East by means of the Santa Fe Railroad.

INEXHAUSTIBLE FUEL.

KEEPING WARM.

Probably very few have ever considered what a perpetual and all-important part heat plays in their lives.

All of us have at some time or other known what it means to miss a train on an icy winter's day, and in consequence to hang about half-frozen without the possibility of a warm up, internal or external; but it is a hundred chances to one that so soon as we dropped into an armchair before a cosy fire at home we gave no further thought, at any rate, to the scientific side of the matter.

Keeping warm, however, is, one may safely assert, the most important of all matters in this universe. Neither man, beast, nor plant can exist without it.

Nature has made the most elaborate arrangements for the keeping warm of this little globe of ours, and to this end the sun supplies us, year in, year out, with a total heat equal to that which would be created by the burning of 43,200,000,000,000,000,000 tons of coal per hour. Our earth manages to catch a small part of this warmth. A trifle of heat which could be given by only 21,600,000,000 tons an hour of coal is all we get the benefit of. No wonder we who are stout sometimes feel a little troubled with the heat during a scorching summer.

Not only does the sun provide us with present light and heat, but in past ages its warmth encouraged a marvellously free growth of vegetation, which time has turned into coal, and which we are able nowadays to use to supplement the sun's heat.

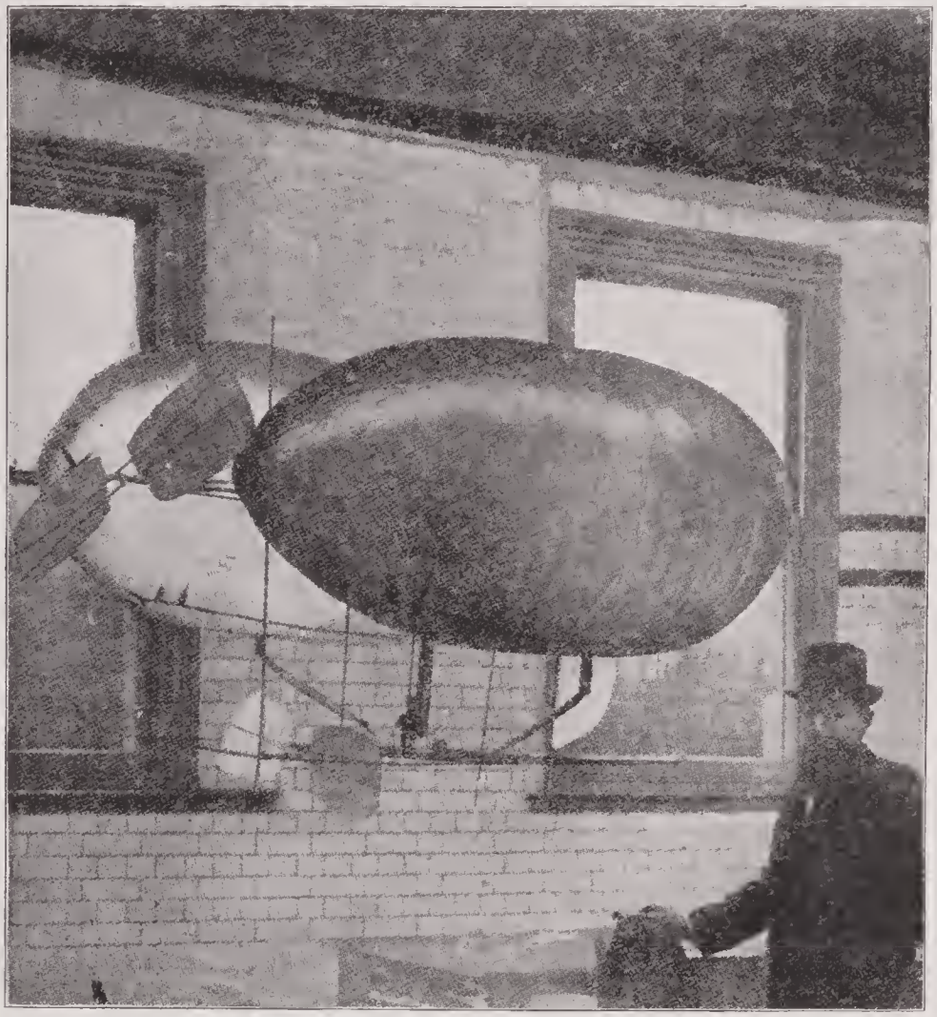
Everyone knows that at certain periods of the year our side of the earth is so placed as to receive a smaller share of the gratuitous warmth showered so freely at other times by our common furnace, the sun. These changes have made all the races of mankind search out for themselves artificial means of adding to what may be termed the universal free heat. How the different races set about achieving this end forms quite an interesting subject.

PRIMITIVE FIRE-MAKING.

The aboriginal savages, whose habits and methods are fast being changed or falling into disuse with the ever-encroaching march of civilization, have the knack of creating fire with a couple of sticks and a piece of wood which, when all is said and done, is superior, if not so quick, as our box of vestas, for the latter are so often missing just when most wanted; but a stick and a piece of wood can be readily obtained almost anywhere.

Following upon the causing of flame by friction of wood, man devised the flint and tinder method of striking a light, and this satisfied everyone right down till the time of the sulphur-headed match of comparatively recent years.

For keeping warm out of doors, man practically all the world over, and at all times, has followed one plan. The difference between the savage's sheep or lion or bearskin, and the magnate's fur coat, of dimensions prodigious on a scale proportionate with his banking account, is only one of degree. The principle is the same.



Airship from England. The airship here portrayed is the invention of Mr. L. J. Anderson. It was successfully tried at the Balloon Hall at Highbury. Its buoyancy is given by twin balloons, between which are the mechanism and propellers, of which there are three.

It is when we come to interior warming that the differences of method become most striking and interesting.

The Arab of the Syrian desert says that we Europeans have bad noses, and possibly he is right. At any rate, there are few European noses which can stand the odor the Arab causes in his endeavor to keep his tent or house warm by means of lighting a charcoal or damp wood fire right in the centre of his living room without any flue to carry away the smoke and fumes. The swarthy descendant of Shem and his family, however, enjoy it to the full.

Amongst civilized peoples during the last hundred years a great deal of attention has been paid to the question of heating rooms, both large and small. Open

fires, closed stoves, elaborate hot-water pipes, hot-air pipes, gas-fires, gas-stoves, electric fires, have all been tried.

The old English handsome open fireplace holds a dear place in all hearts, but we must perforce move with the times. Fancy an old English fireplace in a modern flat! But we cannot, for would it not more than fill the biggest room in the whole menage? No, the old English fireplace for most of us must be a most interesting reminiscence of a picturesque past.

ANTIQUATED METHODS.

The Germans and Russians, until quite recent years, were behind us in most matters of scientific home comforts, but their system of heating rooms by great ornamental tiled stoves was far in advance, from an economic point of view, of our English fire-grates of the same period—say fifty or a hundred years ago. They burned less coal and gave out more heat. Whether they are equally ornamental must be left to each person's own sense of the artistic.

Just as the old English fireplace has had its day, so, too, the cumbersome Continental stove, with its elaboration of artistic tilework, has perforce had to give place to the more practical, modern, compact gas-heater.

During the past ten or twenty years the gas-stove has held sway all the world over. Its superiority over all the old forms of interior heating was undoubted, but its turn to give place to a more scientific, economical and every way better appliance has come. Doubtless electricity will be the main means of heat in the future.

BRIQUETTES TO SUPERSEDE COAL.

In 1903 and 1904, there were about forty fuel-patents, most of them on briquette processes, such as:

"For making briquettes with binder obtained by boiling seaweed.

"Compressed fuel made from peat, without any other binder.

"Smokeless compressed fuel made from slack or fine coal, and a binder obtained from sago-yielding plants.

"Briquettes made from comminuted coal, coke, or other combustible, with molasses for binding material.

"Fine coal with a binder of pitch which has been treated by carbonic acid.

"Briquettes made from slack or culm mixed when heated with paraffin residuum, borax, antimony, acetic acid, oil-cake meal, clay, crude potash and salt.

"Process of making artificial fuel from sawdust, coal dust, peat and various forms of waste or earthy matter, with mineral oil.

"Smokeless briquettes made of fine divided coal or other carbonaceous material, and a binder made from butchers' waste.

"Compressed artificial fuel, consisting of a mixture of coal ashes, sawdust, sand, paraffin wax and sodium nitrate.

"Artificial fuel, consisting of coal dust, screenings, or waste, sawdust, rosin, sour beer and molasses, compressed.

"Composite peat block, consisting of a core and shell, the shell being formed of pulverized peat and containing less moisture than the core."

A government expert says:

"We shall be using briquettes on a large scale in this country within a very

few years. This is an industry which, although it has no foothold today, is bound to come to the front. Conditions which have been unfavorable for it in the past are rapidly changing. In Germany one-third of the entire coal mined is lignite, nearly all of it being briquetted before use. Briquettes are retailed there by count instead of weight. A German friend of mine recently told me that when he was at school he used to buy eight or ten briquettes each morning, put them into a porcelain stove, and close the draught tight. They would thus burn all day long.

"For domestic purposes the briquette offers an exceedingly economical method of using coal. With lignite, or with the fine coal produced as the result of the mining industry, or even with very dry bituminous—as those coals are called which do not fuse when thrown on the grate—efficiency is greatly increased by this process. Lignite goes all to pieces under combustion, and with the other kinds that I have mentioned a large share of the combustible material is lost through the grate bars. If these were made sufficiently small to hold everything in, the air supply would be insufficient. But when these coals are manufactured into briquettes they hold together in that form until consumed. Everything burns to an ash and without clinkers.

"From letters I received I am convinced that the era of the briquette is rapidly approaching. Experiments are in progress in many quarters. German and English manufacturers have been looking over this country with a view to establishing plants here; they think the market not quite ripe, I understand, but I believe they are mistaken."

PEAT IN GREATER QUANTITIES THAN WOOD AND COAL.

Peat briquettes, all peat except a pinch of ashes, can now be made by improved processes for $1.21 a ton. The peat supply increases proportionately with the distance from the equator. In cold and wet countries the climate does not well do the drying, and methods have consequently to be resorted to. So prepared, there is peat enough distributed here and there in the world to conduct a substantial civilization on for an indefinite succession of centuries. Alaska has plenty of it, and so has Siberia, with ample deposits in other far northern countries. Sweden already uses 2,000,000 tons of the briquettes yearly, and within fifty miles of Chicago and New York, are deposits of the material sufficient to supply those cities with fuel for a period to come, perhaps as long as they may have any use for fires or domestic hearths to light them on. One-seventh of the area of Ireland consists of peat bogs heretofore not to be profitably worked, but by the new process made as valuable as coal mines.

FRICTION AS A HEAT PRODUCER INSTEAD OF COAL.

The invention of a negro in St. Joseph, Mo., will probably revolutionize the heating systems of the world in a few years. Scientific men who have seen it believe that in a few years the production of heat by combustion will be a thing of the past, and that in the course of time, as improvements are made upon

The "Wolvin," the largest fresh-water ship in the world. Length, 560 feet; beam, 56 feet; depth, 32 feet; cargo capacity, 12,500 tons.

the invention, coal and wood will no longer be used for heating purposes.

The invention is that of Charles S. L. Baker, and it has been demonstrated that it will produce heat enough to warm the largest building in his city in the coldest weather, without the use of coal or wood. The heat is produced by friction.

Baker has built a machine that produces enough heat by friction to warm one of the largest buildings in St. Joseph. It has been installed in the basement of the First National Bank building and thousands of people have witnessed its wonderful work and have been forced to admit that he has solved the problem of heating without combustion.

COCOONS AS A HOUSEHOLD INDUSTRY.

In 1901, while traveling in the South, Secretary of Agriculture Wilson made up his mind that every possible effort ought to be made to improve the condition of the extremely poor people of the Southern states. Among the ideas which suggested themselves to him was that of silk culture, which he well knew was a household industry in other parts of the world and added materially not only to the national wealth and prosperity of those countries in which it was carried on, but also to the family incomes of the poor. Thus it came about that he asked Congress to give him money for experiments.

Silk culture was pursued in a small way by the early colonists of Virginia, South Carolina and Georgia, the reeled silk and cocoons being exported to Europe. It was introduced in New England as early as 1660. In 1835 Windham County, Connecticut, produced four tons of cocoons. Interest in the industry became widespread and soon passed all bounds, giving rise to what came to be known as the "Morus multicaulis (mulberry tree) craze." Expecting a most profitable investment, if not speedy riches, thousands of persons purchased mulberry plants—they brought sometimes as much as $5 apiece—and set them out over large areas of valuable land. The money expended was far in excess of possible returns. Frosts destroyed the trees and the bubble soon burst.

But this gigantic failure did not prove that silk culture, properly pursued, could not be made a success in the United States, where the climate, over most of the country, is excellently adapted for the purpose. What should be realized is that there is not a fortune for anybody in the production of cocoons. In Europe silk-worms are raised on a small scale in a multitude of households, each of which adds a bit each year to the family income by turning out a few pounds of cocoons. If we succeed with the work on this side of the water it will be on that basis.

GOVERNMENT ENCOURAGEMENT.

To encourage this work, the government instituted a complete silk-growing and silk-weaving plant, and opened an immediate market for the home-grown cocoons.

All the cocoons that can be obtained from native growers are purchased, and the fibre is reeled from them in this

government factory. The process is both pretty and interesting. The cocoons are thrown by handfuls into hot water, contained in shallow metal basins, and bob about in lively fashion as the silken threads are unwound from them. The silk, of a beautiful golden color, is finally wound upon reels, on being taken from which it assumes the form of "hanks." What is known as "floss," or waste silk, is from the outside of the cocoons and is not employed for weaving, though it has other uses.

AROUSING INTEREST IN SILKWORMS.

The department has found that it is easy enough to arouse an interest in silk culture. There are tens of thousands of persons in the United States who are eager to learn of some means whereby they may increase their incomes by ever so slight an amount. The only difficulty is to prevent the growth of extravagant ideas regarding the profits to be obtained from the industry. Many already have abandoned the work because they were not satisfied with the small sums received from the government for their cocoons. On the other hand, many seem to be much interested and content with what they get. It is believed that enough persons will take up the business and keep at it before long to assure a very large annual crop.

Meanwhile it is the policy of the government to create for a time an artificial market, so to speak, in order to interest individuals throughout the country in the art of silk raising and to stimulate effort in the production of the best possible cocoons, the prices paid being according to quality. This plan, if Congress continues to supply the money, will be pursued until a time comes when a natural market is supplied. Meanwhile the raw silk turned out at the factory in Washington, while

The Maudie airship, one most successful in England.

of the finest quality, is produced at a loss, the cost of it being greater than the price it will fetch. This condition of affairs, however, is due largely to the fact that operations are conducted on so small a scale.

THE FIRST STEP.

The first requisite step in this great enterprise is to insure the planting in suitable places of enough mulberry trees to feed the worms. Large numbers of white mulberries grow here and there throughout the United States—some of them descendants of cuttings set out in the early thirties, during the famous silk-worm craze. Others are the result of the accidental distribution of seeds by birds. Altogether, enough of the trees already are growing to provide for a very considerable annual crop of cocoons. But it is desired to increase the available supply as much as possible, and, with this end in view, cuttings are being furnished free of charge to applicants.

This country imports annually about $42,000,000 worth of raw silk, half of which comes from Japan. From Italy we get about $10,000,000 worth, and from China more than $3,000,000 worth. France contributes $2,000,000 worth. It is a lot of money to spend for stuff which might be produced just as well at home.

CIRCULAR ISSUED BY THE GOVERNMENT.

UNITED STATES DEPARTMENT OF AGRICULTURE,

DIVISION OF ENTOMOLOGY,

WASHINGTON, D. C.

CIRCULAR OF INFORMATION IN REGARD TO THE WORK IN SILK CULTURE.

This division has been charged with an investigation of the possibilities of profitable silk culture in the United States. Since it has already been shown that cocoons of excellent quality can be raised over practically the whole country (wherever the mulberry will grow), our first step is evidently to interest as many persons as possible in the cultivation of the silkworm in order that there may be a guaranteed supply of cocoons when the time comes for the establishment of silk reeling on a commercial basis. Therefore, to all persons wishing to engage in silk culture and who do not possess the necessary food plants, the Department will send mulberry cuttings in small numbers, and to those persons who already have the proper mulberry trees we will send, in season, enough of the silkworm eggs for a good start. It is hoped that before long private enterprise will take up the matter of erecting silk-reeling plants and thus create a permanent market for the cocoons. In the meantime, so long as Congress appropriates for the purpose, we will buy the cocoons at approximately the current European market price, which is from 75 cents to $1 a pound for dried cocoons. We are operating a reel at this office in order to convert the cocoons into marketable raw silk.

Persons who desire silkworm eggs should request them in March, April or May, giving a statement as to the number and kind of mulberry trees to which they have access. The leaves of the white mulberry (*Morus alba*) and its varieties *moretti, rosea, japonica,* and *multicaulis* make the best silkworm food. The Russian mulberry, another variety of *Morus alba* known as *tartarica,* is also an excellent variety for this purpose and is best suited to the Northern States. The leaves of Osage orange make very good silkworm food if the young and too succulent ones are avoided. The native red

mulberry and the paper mulberry are not at all suitable.

We will distribute mulberry cuttings during winter and spring.

It is hoped that silk culture may prove of benefit to those members of families whose time is not altogether occupied in other ways, and also to other persons in a small way as a side issue.

L. O. HOWARD,
Entomologist.

Approved:
JAMES WILSON,
Secretary of Agriculture.

Washington, D. C., October 7, 1903.

FROG RAISING.

"Frogs!" said the marketman. "I could sell a thousand of them this minute if I had them. While the clubs and big hotels are crying for them we can't get a baker's dozen in a week."

Recognizing the growing demand for frogs as an article of epicurean diet, the Fishing Commission of the State of Pennsylvania has decided to encourage the raising of frogs by distributing free millions of tadpoles to farmers and others who are in a position to take up frog raising as an industry. Heretofore there has been little systematic attempt to supply the market with frogs. In vacation days bands of boys have hunted the marshlands in search of the croakers, knowing that they were sure of a little pocket money for the trouble of taking a basketful of "bulls" to market.

The method of catching the frogs has been to fish for them with a hook and line, the bait being a piece of red flannel. The game will jump for this delusive temptation and find itself caught on the hook. Another way the boys have of obtaining a supply of frogs for the market is to shoot them with small shot from an air rifle. The regular fishermen, those who eke out a living by catching frogs when fish are scarce, and who ply their trade in the swamplands of Jersey and elsewhere, depend on a net and the quickness of their hand to capture the elusive quarry.

With only these irregular sources of supply the marketmen have been unable to furnish their customers with a steady quantity of frogs, and at times the caterers have been compelled to withdraw the item from the menus. The law governing supply and demand has put the price of frogs in these times to a figure that makes it actually profitable to raise them for market purposes, and the State of Pennsylvania intends to assist all who wish to take up the industry by supplying the nucleus for a froggery.

Epicures say that fried frog is a dainty fit for a king. Some eat only the legs. In the markets, however, frogs are exhibited in their entirety, minus the skin. It is said that all parts of the frog are edible, but some limit their desires to the hind legs. The appearance of the frog, both before and after he has been prepared for sale in the market, is not appetizing, but those who are able to close their eyes to this drawback say that as between fried frog and fried chicken their preferences are decidedly with the former.

PROGRESS OF ALASKA.

For years Alaska was practically out of the world, and even the name of Seward, in connection with her, was a byword and a hiss.

Today, however, matters look different. For years she has been pouring into the lap of Uncle Sam gold in super-abundant amounts, and only during this season her shipments aggregate $35,000,000—nearly five times the amount paid to Russia for the Territory.

And this is not all. The Territory is rapidly developing a diversity of resources that are astonishing not only the natives, but the world at large, and if these developments continue to pan out, as they are now showing up, it will not be many years until she will be knocking, fully equipped, at the door of the nation for statehood.

As an indication as to her progress, Alaska has now four lines of railroad in partial or full operation, with two others in preliminary stages of construction, while proposed railroads are numerous.

The principal camps now have telegraphic communication with the outside world and a military cable line between Seattle and Juneau will be completed this summer.

Nome alone received 75,000 tons of freight during the season of 1903, and more than 5,000 passengers arrived, while over 10,000,000 feet of lumber was landed there for building purposes.

AN INSTANCE IN THE RISING VALUE OF REAL ESTATE.

The lot at the northeast corner of State and Madison streets, Chicago, upon which an annual rental of $50,000 is being paid, and for which a purchase price of $1,500,000 is reported to have been refused, sold as low as $327 early in the winter of 1839, when the few whites of "Chicagou" found sport in hunting rabbits in the brush and wildwood between Van Buren and Twelfth streets.

When Dr. Sylvester Willard paid the $327 in cold cash for "lot 8, block 14, Fort Dearborn addition," the villagers were shocked. That Dr. Willard was prosperous in his practice was evident, else why should he indulge in such "reckless plunging?" It is true that some of the more critical of the villagers transferred their patronage to other doctors—there were three or four more here then, because they feared that his judgment had become unreliable. Dr. Willard himself questioned the wisdom of his action, and before the '40s were two years old he was "fortunate" enough to dispose of the land to Erastus Cole at a profit of a few dollars.

Mr. Cole, too, concluded after a year that he had taken "an elephant on his hands," and was happy to sell the lot to S. W. Peck, who, in 1845, transferred it to his partner in business, L. W. Boyce, for the handsome price of $750.

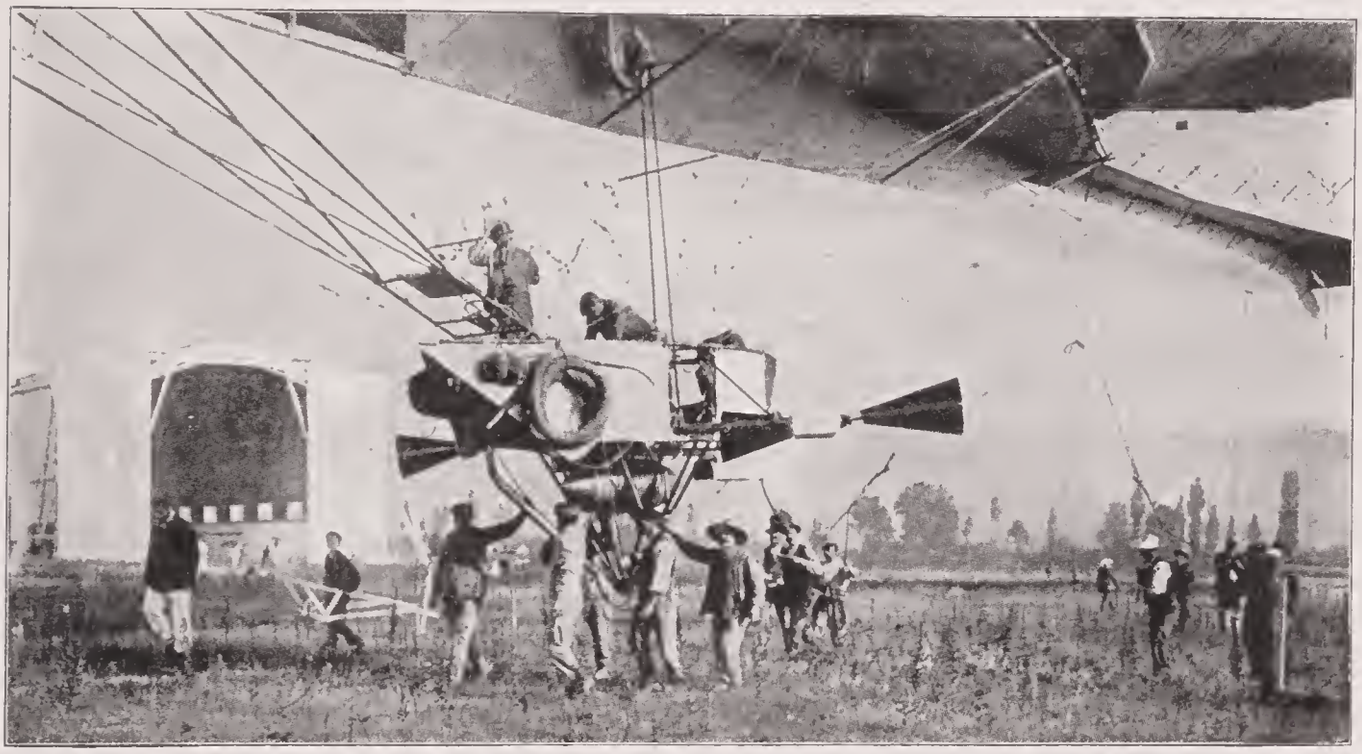
Mr. Boyce's judgment was questioned quite as harshly as Dr. Willard's had been, but he defended his action by saying that the purchase was not made for investment purposes, but because he

wanted a "nice, quiet spot for a home." Mr. Boyce erected a house on the land and lived there several years with his family.

The property changed hands a few more times, and in 1870 Marshall Field, foreseeing the future greatness of the city, bought the house and land for $191,000.

It was now that the people were criticising Dr. Willard for disposing of the property. Also, the others through whose hands it had passed came in for their full shares of criticism.

Two decades ago Mr. Field negotiated a ninety-nine-year lease on the land, the annual rental being $40,000 for the first seven years and $50,000 a year for the balance of the period.



Ready for a start. View of mechanism of modern dirigible airship.

HOW AIR BRAKES WORK.

Everyone has heard of the air brake and references to it are sure to be made when the subject of protection against railroad accidents is under discussion, but like many inventions in common use it is more or less of a mystery for which an explanation is demanded from time to time.

The modern air brake consists of twelve parts, among which are: The air pump, which compresses the air; a main reservoir, in which the air is stored; the engineers' brake valve regulating the flow of air; the train pipe, which connects the brake valve with the triple valves under each car; the quick-action triple valve, controlling the flow of air to and from the auxiliary reservoir, which is supplied from the main reservoir, and the brake cylinder piston rod, which is forced outward, thereby applying the brakes.

The theory of the air brake is the

equalization of pressures. When the brakes are not in action, the pressure on the train pipe is made such as to prevent an escape of air from the auxiliary reservoir. When the engineer desires to make an application of brakes he turns his brake valve so that there is a moderate reduction of the pressure in the train pipe. This causes the greater pressure in the auxiliary reservoir to force air into the brake cylinder, forcing the piston out and applying the brakes.

When it is desired to release the brakes the engineer turns his valve in the opposite direction, permitting the air to flow from the main reservoir located on the engine into the train pipe. When the pressure, thus restored in the train pipe, is increased above the pressure in the auxiliary reservoir certain valves are moved, communication is thereby restored between train pipe and auxiliary reservoir, the piston is forced to its normal position, the air escapes from the brake cylinder and the auxiliary reservoir is recharged through the train pipe.

When the train breaks in two or a hose pipe connection is broken it has the effect of a sudden and material reduction of the pressure in the train pipe, the same as though the engineer had made an emergency application. The sudden reduction of pressure also opens supplementary valves, which increase the pressure upon the brake cylinder about 20 per cent. The brake shoes are attached to rods which are in turn attached to the piston in such manner that when the air from the auxiliary reservoir forces the latter out a pulling force is exerted upon the brakes.

BABY INCUBATORS.

The name "incubator" we naturally associate with the idea of hatching chickens without the aid of the patient hen. The principle in operation in the case of the undeveloped human infants is precisely the same. Heat is the essential factor in producing this artificial development; but it is heat regulated by limitless skill and accompanied by infinite patience and devotion.

NURSERY IN WHITE ENAMEL.

Incubators of the Kny-Scherer pattern have the doors and sides of plate glass, so that the tiny occupants are plainly visible to the visitors.

The mechanism that fosters life in such puny infants as, a few years ago, were considered hopeless cases is almost as interesting as the babies themselves. Each incubator is attached to the fresh-air pipe through which the current of air is introduced by means of an electric fan. The air passes first through a box containing chemicals so that it is thoroughly disinfected. Thence it circulates over hot water pipes and finally filters up through the mattress of absorbent cotton on which the small patient lies. By this means all dirt and germs are eliminated. The temperature is maintained by means of a series of hot water pipes in communication with a tank that is heated by a gas jet. A thermostat containing ether serves as an automatic heat regulator.

BOWS DISTINGUISH SEX.

In addition to the hot water tank outside, there is a tank beneath the baby's mattress, so that if anything should go

wrong with the apparatus the temperature could still be kept up. A thermometer and a barometer serve to show the exact condition of the atmosphere at all times. Very fragile babies, those that have received the poorest start in life, sometimes require a temperature of almost 100 degrees.

These are the infants whose entire costume consists of a square of sterilized cheese cloth lined with a thick layer of absorbent cotton. This is folded around their tiny bodies, turned up over the little feet and securely pinned. The babies have but one ornament, a bow of pink ribbon if they happen to be boys and a bow of blue if they are girls. The very delicate ones are not bathed, but each morning are treated to a coat of warm oil, which both nourishes the tender body and aids in preventing the shock that the most carefully administered bath would be more than likely to produce.

For blue babies, those whose respiratory organs are poorly developed, there is the oxygen tank, that pumps a strong current of oxygen into the little lungs that have not yet learned to breathe. Blue babies are found among otherwise normal children, but this unnatural color is not a menace to life except when it is due to an imperfection of the heart or when the whole body is imperfectly developed. Among the latter kind some have a digestive system so poor that even the nourishment administered by a medicine dropper cannot be used, because the tiny throat has not acquired the art of swallowing. In these cases gavage feeding, by means of a rubber tube and a bulb that works like a perfume atomizer, is resorted to.

INFANTS FED OFTEN.

The stronger babies soon learn to take the bottle, just as normal babies do. The nourishment is one of the greatest sources of care to the attendants. It is modified milk or beef juice or whatever the stomach can assimilate, but each baby has its own formula by which its food is prepared. All the little ones are fed at intervals of two hours during the day and three hours at night, which is a good rule for all young babies.

The question most frequently asked is: "Where do the incubator babies come from and where are they going?" They come from all the maternity hospitals and from many private homes, and the most beautiful thing about it is that the little pauper who has no parents and no home receives exactly as much care and attention as is lavished upon the child of opulence that has been sent here because it is sure to receive the most scientific treatment.

ELECTRICITY ON THE FARM.

IT BIDS FAIR TO PLAY IMPORTANT PART IN AGRICULTURE.

The automobile plow, the gigantic harvesters which cut, bind, thrash and measure the wheat in one continuous operation, the various self-propelling traction machines which do the work of many horses, the hay-loaders, the mechanical milkers and the endless variety of ingenious and costly devices which now beckon to the farmer and assault his pocketbook may have led him to think

that perhaps the limit has been reached; for he has no hope that the greatest genius will be able to produce an electrical farm hand, which is his greatest need. Not so; the farmer of the future, if enthusiasts say true, may be independent even of the sun; he may stand at his switchboard in the farm offices and throw out the electricity to the potatoes, send along a generous voltage to the beans, electrify the cabbages and wake them up to their duty and send a vivifying thrill through the homely but hygienic beet.

A Belgian scientist, Prof. Guarini, says that electricity is the life of plants. This electricity is supplied in the atmosphere, but sometimes the supply is not generous enough. It is a mistake to think, he says, that light alone will nourish plants. Scientists have shown these forty years that artificial light is a great stimulus to plant life and that if electric light be applied at night in the right strength and for the right length of time the results in larger and more vigorous crops and plants will be startling. Prof. Gaurini shows in a simple experiment that it is not the light alone which does the work; it is the electric radiation combined with the light, whether the electric radiation come from the sun and its rays or from the arc lamp. He surrounds a plant, for instance, with a metal cage through which the sunlight streams freely, but the cage acts as a conductor for the atmospheric electricity and behold! the plant withers and becomes anæmic.

On the other hand, a plant may be put in the dark and then given intelligent electrical treatment. The professor recommends the use of the high-tension continuous current, which, our farmers perhaps would like to know, may be obtained the most economically and efficiently from three dynamos, each capable of giving a current of 23,000 volts, the three to be coupled together, so that the maximum current of 69,000 volts may be sent out to the vegetables. By this method the carbonic acid in the chlorophyl is decomposed, producing carbon and oxygen; the chemicals in the soil are also decomposed and the nourishing elements rush to the aid of the plant. By this method many fine crops could be raised in a season and the expenditure on a large operation would in time be justified. In a greenhouse where the conditions are just right for the control and expenditure of the electrical energy without wastage in the open air there is, according to the professor, no doubt of success.

We cite these scientific experiments in order to keep abreast of scientific endeavor, but we do it timorously, because when the farmers hear of Prof. Guarini and his volts they will have something harsh to say about this scientific farming.

BOOK III

GREAT QUESTIONS

AND

INTERESTS OF GOVERNMENT AND CIVILIZATION

Now Perplexing the Rulers of the World

STATEMENT AND EXPLANATION OF THE WEIGHTY AFFAIRS OF STATE THAT ARE OF PERSONAL AND PUBLIC INTEREST IN THE GOVERNMENT OF NATIONS

Hope amid the darkness and desolation of war. M. Thiriat, as a French conscript, knows something of the dark side of militarism. Here he pictures in the background the field of the Russian slain, with the hungry ravens flitting restlessly in the darkness and desolation above the mass of human beings, dead, wounded, and war-worn after the hard fight. But even in the midst of all this desolation shines the light of Help and Hope in the person of a nursing sister, on whose robe flames the Red Cross of the most beneficent order in the world.

GREAT QUESTIONS AND INTERESTS OF GOVERNMENT.

WAR.

ITS IRRECONCILABLE CONTRADICTIONS.

WAR, which is regarded as one of the greatest scourges of the human race, has in these later days been invaded by paradox, and behind the grim and awful presence of war paradox grimly lurks, exhibiting a sardonic humor, at which men, albeit unwillingly, cannot but smile. Above the clash of arms and the fury of contending hosts in the Far East are heard the great guns of the pundits of International Law, and it is in this obscure science that paradox pure and simple appears to run riot at the present moment. Who so correct in their interpretation of war, as waged by civilized man, as the Japanese, whose courage is only equalled by their humanity, and the fury of whose attack is paralleled by their care for the wounded of the enemy? And yet—Korea is nominally an independent power owing allegiance to its own emperor, and Manchuria is technically an integral portion of the Chinese empire! Does international law permit of war between two countries taking place in the territories belonging to a third—and a fourth? But this is happening, and the civilization of Europe has made no sign that an overt act infringing the right of neutrals is now in course of perpetration. From London and Vienna, from Petersburg and Paris, from Berlin and Rome, have come mutterings such as precede the storm with regard to the entirely fresh and strikingly new interpretation of the rights of belligerents on the high seas.

THE GOLDEN RULE OF POWER.

Authorities in the Russian capital are to be found to maintain the thesis that a ship can be a merchant vessel before she passes the Dardanelles and a man-of-war as soon as she reaches the Red Sea, and all this without infringing the Treaty of Paris of 1858; these are jurists of a singularly subtle turn of mind, but the direction in which they are tending makes once more for "The good old rule, the simple plan, That they should take who have the power, And they should keep who can!" But mark the argument. "A door," say the Russian authorities, "cannot be both open and shut, and for years you, the Great Powers, knew that our volunteer fleet was passing freely in and out of the Black Sea, and you never protested; now, when it is some use to us, you do; it is really most unreasonable." Whether these same people expected England and Germany to acquiesce tamely in the wholesale stoppage, capture, and sinking of their merchant vessels it is impossible for outsiders to determine; but at all events their interpretation of the rights of belligerents as against neutrals certainly seems, in the opinion of these

latter, to savor of paradox, and, with considerable lack of humor, they have failed to appreciate the joke.

We have seen that the very basis of International Law—that every country is master of its territory; and that, in that territory, no outsider possesses any rights at all—has been violated by both parties in the present conflict, and that one of them is creating new records in dealing with neutrals upon the high seas; the right of search apparently carrying with it the right of capture, and the right of destruction. But if we turn from this crude and elementary absurdity, which seems the fantastic vision of a madman, one has by no means done with paradox, as applied to war.

PROBLEM OF WIRELESS TELEGRAPHY.

Let us take the case of wireless telegraphy, which, in the hands of a mischievous third party, can be turned to uses by no means intended by the belligerents. Are we to contend, as did the Russians in the case of the Times steamer Haimun, that an installation of this new scientific wonder is contraband of war, and it is therefore competent for either side to capture and hold the vessel in which such an apparatus is carried?

If this is so, that is if wireless telegraphy is to be considered as contraband, in what category will the submarine cable stand?

Here again is a sort of glorious jumble, as the special conference on this matter, of 1884, settled practically nothing. It certainly laid down a rule that belligerents must not tamper with cables connecting neutral countries; but could merely express pious and academic hopes regarding the fate of such as joined a neutral and a belligerent. No one in consequence quite knows where he is in the matter, and when opinion is fluid in such things, convenience is apt to dictate practice; especially as a submarine cable may well prove a more formidable foe, or at all events, as formidable a one as the fleets and armies of the enemy.

THE GREAT PEACE CONVENTION OF THE HAGUE.

We have also the paradox of the decisions of The Hague convention. In the interests of humanity no one is allowed to fill shells with gases destined to asphyxiate the enemy when liberated; so far so good, but if a shell charged with any of the high explosives bursts, say, in the casemate of a six-inch gun, those who are not killed by fragments thereof will most certainly be stifled by the fumes exhaled; but then these are, to start with, contained in the explosive before they are put in the shell. This, no doubt, will be a great comfort, in their last moments, to those who are put out of the world by this means. The use of electro-contact mines, containing anything from 500 to 1,000 pounds of high explosive, is considered legitimate by all the nations, but there is no occasion to speak of the liberation of poisonous gases here, as the explosion takes place under water and its effect is to send a first-class battle-ship and her crew to the bottom.

THE EVOLUTION OF MIGHT AND RIGHT.

In the old days the great giant was supreme in his tribe. He could choke a

bear with one hand. All looked up to him and bowed down to him. His word was law.

Then came the sharp bow and arrow, and the little man standing off a few yards became the equal of the biggest man—his superior, in fact, since it was easier to hit a big man with an arrow than a small one. That was the first blow at physical violence.

By and by the suit of steel armor came along, and the rich man who could pay the skilled Milanese artisan for his best work could ride, sword in hand, through a regiment of huge peasants, hewing them down at will.

Along came gunpowder and the leaden bullet that could go through the finest steel. Armor vanished and kings and dukes got out of the habit of riding in front of their armies.

For a little while individuals kept on their dueling, but they found it did not pay, and the men who formerly met on the "field of honor" now hire Choate or Hornblower, and fight it out up to the Supreme Court, with no more vicious weapon than the typewriter and the fountain pen.

The nations are still conducting their quarrels as individuals did. But they will not keep at it long.

England learned from the Boers what Russia is learning from the Japs—that a small power, able to shoot straight, is a dangerous thing for a great power to attack.

Already the Russians find, as the English did, that if they go a few thousand miles away from their own front yard they are helpless against a ridiculously inferior nation.

The perfection of the flying machine is only a question of years.

Give the Japanese today half a dozen flying machines, able to drop a few tons of dynamite into St. Petersburg and Moscow—and how long do you think it would be before Russia would ever again declare war on Japan?

Enlightened individuals no longer fight today, because the smallest man can kill the biggest in a second, and because habit now makes us despise the brawler and fighter, as we formerly despised the man of peace.

Before many years shall have passed the little nation, instead of being at a disadvantage, will be better off in a fight than the big nation.

Little Switzerland is kept free of interference by mutual consent of the powers. But give her half a million tons of dynamite, a hundred good airships to drop the explosives, and what nation or combination of nations would dare to attack her? Her very littleness and poverty would be to her advantage. The great, rich nations would have everything to lose and nothing to gain.

It does not take much of a look ahead to foresee an actual Parliament of Nations, where international trials will be held, and where all the nations of the earth will uphold the decisions of the court if necessary.

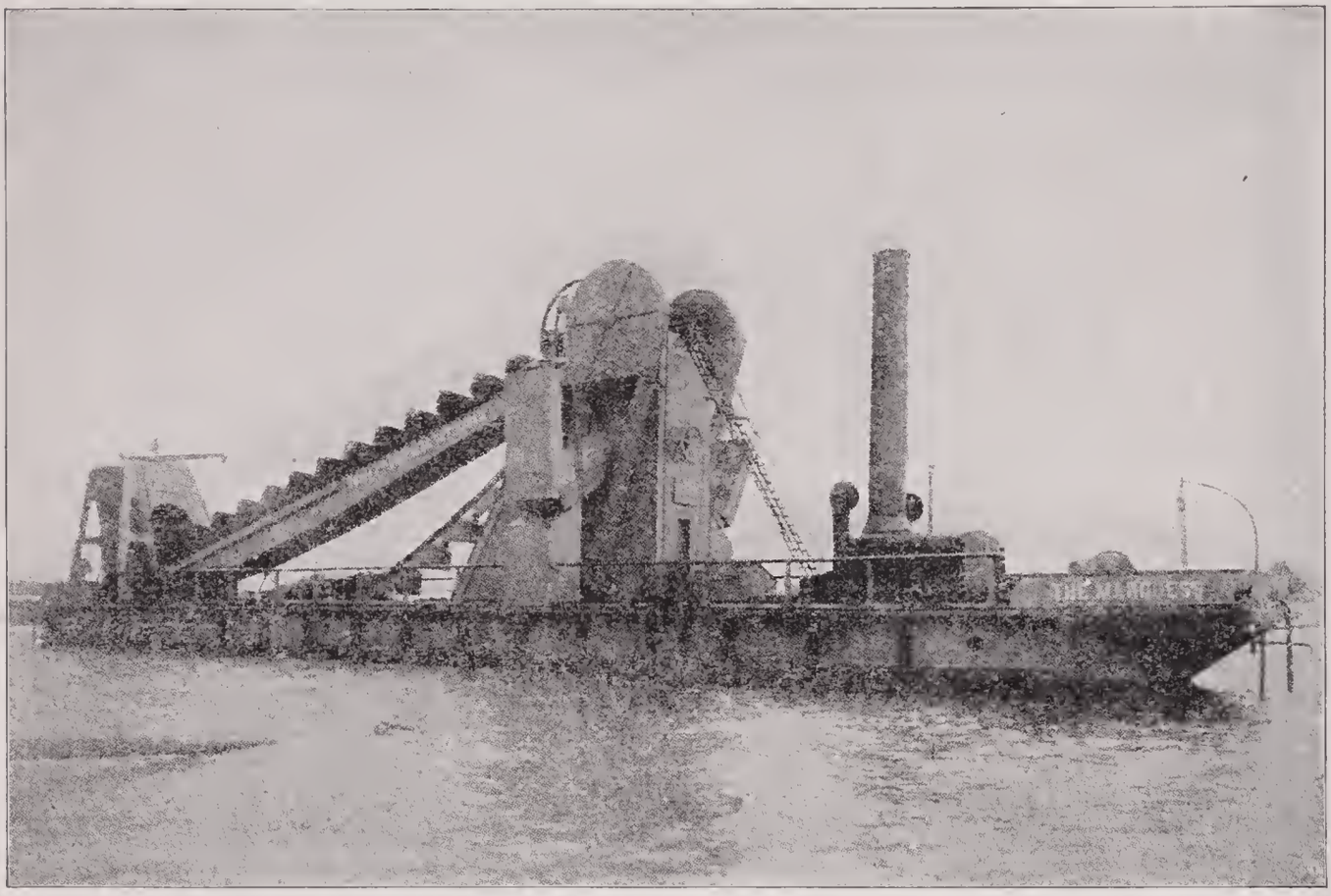
That will be the beginning of a new day. When it comes, the armies that now march up and down practicing the art of murder will be devoted to great national and international works. The power of the nations will be devoted to the development of the world, and not to slaughter.

INTERNATIONAL CONGRESS OF PEACE.

Secretary Trueblood read in the afternoon of October 8, 1904, the last act of the International Peace Congress "An Appeal to the Nations," in part as follows:

"The thirteenth international congress of the friends of peace, held in Boston, October 3 to 8, has met under unusual circumstances. On the one hand murderous war unsurpassed was ravaging a section of the globe. On the other hand, the friends of peace have gathered together in their annual congress on this side of the globe in numbers never witnessed before after a year of unexampled improvement in their cause.

"The congress has deeply felt the bitterness and irony of the situation from the one side. It has also been inspired with great hope and courage at the prospect which presents itself from the other side.



This giant dredger is over 136 feet long, 24 feet wide, and ten feet deep. The bucket ladder is 88½ feet long, and operates to a depth of forty-five feet beneath the surface of the water. At a recent experiment it dredged and discharged 4,536 tons of material into lighters in 319 minutes, or at the rate of 853 tons per hour.

"The cruel war in progress between Russia and Japan—a war which might easily have been avoided if the two belligerents and the other powers signatory of The Hague convention had faithfully kept the obligations as summed in the convention—has made it clear that much yet remains in the eradication of old race

and national prejudices, false ideas of national greatness and glory, perverted conceptions of patriotism and territorial and commercial greed.

"This has also anew demonstrated the necessity of the immediate extension and perfection of substitutes for violence in the settlement of international controversies.

"The congress at the conclusion of the deliberation appeals to the peoples of all nations and of all classes to arouse themselves to a finer and more adequate conception of their rights in the determination of the foreign policies pursued by their governments, that they may no longer be involved, without their consent, in foolish and ruinous wars with other powers or in the unjust exploitation of those whom they are bound by every consideration of righteousness and honor to assist and elevate rather than to plunder and degrade.

"It respectfully invites all the national sovereigns and presidents, all ministers of religion, all instructors of youth in schools of every grade and all others who wield influence in the moulding and directing of public opinion, to throw the entire weight not only of their personal influence, but of their positions, towards eradicating the causes of misunderstanding and conflict and the creation of such a complete pacific public sentiment as will in time render the barbarous method of war impossible."

The appeal was unanimously adopted and President Robert Treat Paine adjourned the congress *sine dic* after he had spoken the thanks of the congress to the press of the country for its reports of the proceedings.

SCOPE OF OPERATIONS OF THE HAGUE TRIBUNAL, WHOSE PRINCIPLES GOVERNED THE INQUIRY IN THE ANGLO-RUSSIAN DISPUTE.

The Hague peace conference, under the general principles of which Great Britain and Russia submitted their dispute over the attack of the Baltic fleet on the North Sea fishermen to an international tribunal, held its first session at The Hague, the capital of Holland, May 18, 1899. It was an international body and assembled in response to an invitation of the Emperor of Russia, issued August 29, 1898.

One hundred delegates, representing twenty-one European powers, and also the United States, Mexico, China, Japan, Persia and Siam, were present. Italy objected to the representation of the Vatican and England to representation of the Transvaal Republic, and accordingly an agreement was reached to admit no representatives excepting those of states which maintained standing armies or navies. No delegates from the Central or South American republics attended.

The conference was presided over by Baron de Staal of the Russian delegation. Its work was assigned to three grand committees, dealing respectively with armaments and engines of destruction, humane regulations in warfare, and mediation and arbitration. This division was decided upon after the proposals of the Czar had been discussed. These had in view concerted action for the maintenance of general peace, the ameliora-

tion of the hardships of war, and the possible reduction of the military and naval armaments of the world.

The conclusions of the conference were embodied in a final act signed July 29, the date of final adjournment. This act consists of three conventions, three formal declarations, and six resolutions. The first convention relates to the pacific adjustment of international disputes, and directly covers the case of the Baltic fleet. The second deals with the laws of war on land, and the third provides for adapting the rules of maritime warfare to the principle of the Geneva convention of 1864.

The three declarations prohibit:

1. The use of projectiles or explosives from balloons for a period of five years. This was adopted unanimously.

2. The use of projectiles that diffuse asphyxiating or other deleterious gases. This was not accepted by England and the United States.

3. The use of bullets that expand or flatten easily in the human body.

In the six resolutions the conference first expressed the opinion that the limitation of military burdens was greatly to be desired, and this was unanimously agreed to; that the questions relating to the rights and duties of neutrals, the inviolability of private property in maritime warfare, and the question of the bombardment of towns should be referred to a future conference, and that the questions relating to the types and calibers of marine artillery and small arms and the size of military and naval budgets should be studied by the governments, with a view to establishing uniformity as to arms and a reduction of military and naval expenses.

The mediation and arbitration agreement was probably the most important work of the conference. The signatory powers agreed to resort to mediation in cases of serious international disputes, and a method of procedure was provided by which mediation may be arranged at the instance of the powers directly interested or by the voluntary offer of neutral governments. The convention further provides that advances for mediation never shall be considered by the disputing parties as an unfriendly act.

NATIONAL HONOR.

With a view to the adjustment of differences where neither "honor" nor "essential interests" are involved, a commission of inquiry is provided for. The duty of this commission shall be to examine the controverted questions of fact, such as are susceptible of judicial ascertainment, and report the result of its inquiries to the disputing powers for their acceptance or rejection.

Finally, with a view to the settlement of international disputes by arbitration, a permanent court of arbitration was created. This tribunal is composed of persons eminent for their knowledge of international law, and is chosen by the parties concerned from a permanent list of arbitrators nominated by the signatory powers. Each power is allowed to name not more than four members, and their term of office is six years. In order to constitute the court for a particular case, each party to the controversy chooses two arbitrators, either from the list of permanent members or from persons who are not members, and these select an umpire. There also are provisions for

choosing an umpire in case the interested parties cannot agree, and also for regulating court procedures and for reviewing decisions.

The diplomatic agents of the signatory powers resident at The Hague constitute, under the presidency of the Dutch minister of foreign affairs, a permanent council which serves the office of permanent court of arbitration. It should be understood, however, that none of the peace officials of the tribunal has the right to take the initiative and institute a court of arbitration. The initiative must be taken by the governments who are parties to the disputes, and by both of them.

SOME DECISIONS.

The first decision by The Hague arbitration court was in 1902, when the United States won the Californian Pius Fund case against Mexico, the latter country having to pay $1,420,683, Mexican, besides an annual payment forever of $43,051.

The second decision was handed down February, 1904, in the Venezuelan case. A dispute arose as to whether Great Britain, Germany and Italy, who had taken strong measures against Venezuela, should receive preferential treatment for their monetary claims, as against the claims of others who did not use force against the republic. The court decided in favor of preferential payments to the three powers named.

AMERICA'S CALL FOR A SECOND HAGUE CONFERENCE.

In a circular note Secretary of State Hay carried out President Roosevelt's instructions relative to proposing a second Hague conference. The note not only contemplates the reassembling of The Hague conference for the consideration of questions specifically mentioned by the original conference as demanding further attention, such as the rights and duties of neutrals, the inviolability of private property in naval warfare and the bombardment of ports by naval force, but goes further by practically indorsing the project of a general system of arbitration treaties and the establishment of an international congress to meet periodically in the interests of peace. The issue of the call while the present war is in progress is justified by the fact that the first Hague conference was called before our treaty of peace with Spain was concluded.

DEPARTMENT OF STATE,
WASHINGTON, D. C.
October 21, 1904.

To the Representatives of the United States Accredited to the Governments Signatories to the Acts of The Hague Conference, 1899.

SIR.—The Peace Conference which assembled at The Hague on May 18, 1899, marked an epoch in the history of nations. Called by his majesty the Emperor of Russia to discuss the problems of the maintenance of general peace, the regulation of the operations of war and the lessening of the burdens which preparedness for eventual war entails upon modern peoples, its labors resulted in the acceptance by the signatory powers of conventions for the peaceful adjustment of international difficulties by arbitration, and for certain humane amendments to the laws and customs of war by land and sea. A great work was thus accom-

plished by the conference, while other phases of the general subject were left to discussion by another conference in the near future, such as questions affecting the rights and duties of neutrals, the inviolability of private property in naval warfare, and the bombardment of ports, towns and villages by a naval force.

PEACE BEGINNINGS.

Among the movements which prepared the minds of government for an accord in the direction of assured peace among men, a high place may fittingly be given to that set on foot by the Interparliamentary Union. From its origin in the suggestions of a member of the British House of Commons in 1888, it developed until its membership included large numbers of delegates from the parliaments of the principal nations, pledged to exert their influence toward the conclusion of treaties of arbitration between nations and toward the accomplishments of peace. Its annual conferences have notably advanced the high purposes it sought to realize. Not only have many international treaties of arbitration been concluded, but, in the conference held in Holland in 1894, the memorable declaration in favor of a permanent court of arbitration was a forerunner of the most important achievement of the peace conference of The Hague in 1899.

The annual conference of the Interparliamentary Union was held this year at St. Louis, in appropriate connection with the World's Fair. Its deliberations were marked by the same noble devotion to the cause of peace and to the welfare of humanity which had inspired its former meetings. By the unanimous vote of delegates, active or retired members of the American Congress and of every parliament in Europe, with two exceptions, the following resolution was adopted:

PEACE CONFERENCE RESOLUTIONS.

WHEREAS, Enlightened public opinion and modern civilization alike demand that differences between nations should be adjudicated and settled in the same manner as disputes between individuals are adjudicated, namely, by the arbitrament of courts in accordance with recognized principles of law, this conference requests the several governments of the world to send delegates to an international conference, to be held at a time and place to be agreed upon by them for the purpose of considering:

1. The questions for the consideration of which the conference at The Hague expressed a wish that a future conference be called.

2. The negotiation of arbitration treaties between the nations represented at the conference to be convened.

3. The advisability of establishing an international congress to convene periodically for the discussion of international questions.

And this conference respectfully and cordially requests the President of the United States to invite all the nations to send representatives to such a conference.

On the 24th of September, ultimo, these resolutions were presented to the President by a numerous deputation of the Interparliamentary Union. The President accepted the charge offered to him, feeling it to be most appropriate that the executive of the nation which had welcomed

the conference to its hospitality should give voice to its impressive utterances in a cause which the American government and people hold dear. He announced that he would at an early day invite the other nations, parties to The Hague conventions, to reassemble with a view to pushing forward toward completion the work already begun at The Hague, by considering the questions which the first conference had left unsettled, with the express provision that there should be a second conference.

In accepting this trust, the President was not unmindful of the fact, so vividly brought home to all the world, that a great war is now in progress. He recalled the circumstance that, at the time when, on August 24, 1898, his majesty the Emperor of Russia sent forth his invitation to the nations to meet in the interests of peace, the United States and Spain had merely halted in their struggle to devise terms of peace. While at the present moment no armistice between the parties now contending is in sight, the fact of an existing war is no reason why the nations should relax the efforts they have so successfully made hitherto toward the adoption of rules of conduct which may make more remote the chances of future wars between them. In 1899 the conference of The Hague dealt solely with the larger general problems which confront all nations, and assumed no function of intervention or suggestion in the settlement of the terms of peace between the United States and Spain. It might be the same with a reassembled conference at the present time. Its efforts would naturally lie in the direction of further codification of the universal ideas of right and justice which we call international law; its mission would be to give them future effect.

The President directs that you will bring the foregoing considerations to the attention of the minister for foreign affairs of the government to which you are accredited, and, in discreet conference with him, ascertain to what extent that government is disposed to act in the matter.

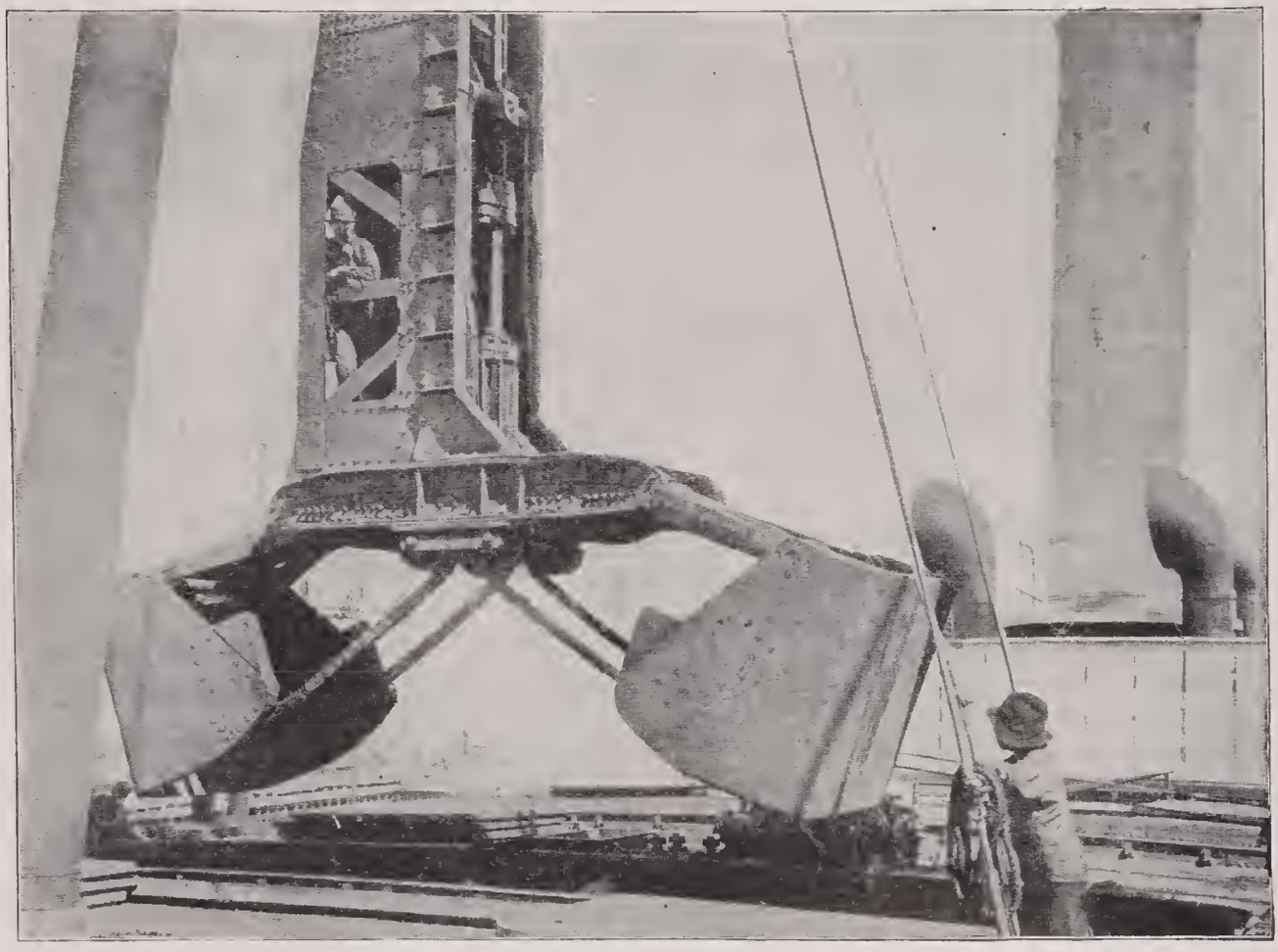
Should his excellency invite suggestion as to the character of the questions to be brought before the proposed second peace conference, you may say to him that, at this time, it would seem premature to couple the tentative invitation thus extended with a categorical programme of subjects of discussion. It is only by comparison of views that a general accord can be reached as to the matters to be considered by the new conference. It is desirable that in the formulation of a programme the distinction should be kept clear between the matters which belong to the province of international law and those which are conventional as between individual governments. The final act of The Hague conference, dated July 29, 1899, kept this distinction clearly in sight. Among the broader general questions affecting the right and justice of the relation of sovereign states, which were then relegated to a future conference, were: The rights and duties of neutrals; the inviolability of private property in naval warfare, and the bombardment of ports, towns and villages by a naval force. The other matters mentioned in the final act take the form of suggestions for consideration by interested governments.

The three points mentioned cover a large field. The first, especially, touching the rights and duties of neutrals, is of universal importance. Its rightful disposition affects the interests and well-being of all the world. The neutral is something more than an onlooker. His acts of omission or commission may have an influence—indirect, but tangible—on a war actually in progress; whilst on the other hand he may suffer from the exigencies of the belligerents. It is this phase of warfare which deeply concerns the world at large. Efforts have been made, time and again, to formulate rules of action applicable to its more material aspects, as in the Declaration of Paris. As recently as the 28th of April of this year the Congress of the United States adopted a resolution reading thus:

Resolved, By the Senate and House of Representatives of the United States of America, in Congress assembled:

That it is the sense of the Congress of the United States that it is desirable in the interest of uniformity of action by the maritime states of the world in time of war that the President endeavor to bring about an understanding among the principal maritime powers with a view of incorporating into the permanent law of civilized nations the principle of the exemption of all private property at sea, not contraband of war, from capture or destruction by belligerents.

Approved April 28, 1904.



Enormous clam shell bucket of an automatic ore loader.

Other matters closely affecting the rights of neutrals are: The distinction to be made between absolute and conditional contraband of war, and the inviolability of the official and private correspondence of neutrals.

As for the duties of neutrals toward the belligerents, the field is scarcely less broad. One aspect deserves mention, from the prominence it has acquired during recent times; namely, the treatment due to refugee belligerent ships in neutral ports.

It may also be desirable to consider and adopt a procedure by which states nonsignatory to the original acts of The Hague conference may become adhering parties.

You will explain to his excellency, the Minister of Foreign Affairs, that the present overture for a second conference to complete the postponed work of the first conference is not designed to supersede other calls for the consideration of special topics, such as the proposition of the government of the Netherlands, recently issued, to assemble for the purpose of amending the provisions of the existing Hague convention with respect to hospital ships. Like all tentative conventions, that one is open to change in the light of practical experience, and the fullest deliberation is desirable to that end.

Finally, you will state the President's desire and hope that the undying memories which cling around The Hague as the cradle of the beneficent work which had its beginning in 1899 may be strengthened by holding the second peace conference in that historic city.

I am, sir, your obedient servant,

JOHN HAY.

CONTRABAND OF WAR. POSITION TAKEN BY THE UNITED STATES.

The United States refuses to recognize Russia's assertion that coal and raw cotton are contraband of war. The position of the Washington government was clearly set forth in an identical note addressed by Secretary Hay to all American ambassadors in Europe on June 10, 1904.

The key of the American position with reference to contraband of war is contained in the following paragraphs of Secretary Hay's note:

"The recognition in principle of the treatment of coal and other fuel and raw cotton as absolutely contraband of war might ultimately lead to a total inhibition of the sale by neutrals to the people of belligerent states of all articles which could be finally converted into military uses.

"Such an extension of the principle by treating coal and other fuel and raw cotton as absolutely contraband of war, simply because they are shipped by a neutral to a non-blockaded port of a belligerent, would not appear to be in accord with the reasonable and lawful rights of neutral commerce."

The circular is based on a declaration by the Russian government that coal, naphtha, alcohol, and other fuel have been declared contraband.

TEXT OF THE HAY NOTE.

The text of Secretary Hay's note to the American ambassadors in Europe follows:

"Department of State, Washington, D. C., June 10, 1904.—To the Ambassadors of the United States in Europe—Gentlemen: It appears from public documents

that coal, naphtha, alcohol, and other fuel have been declared contraband of war by the Russian government.

"These articles enter into general consumption in the arts of peace, to which they are vitally necessary. They are usually treated not as 'absolutely contraband of war,' like articles that are intended primarily for military purposes in time of war, such as ordnance, arms, ammunition, etc., but rather as 'conditionally contraband'—that is to say, articles that may be used for or converted to the purposes of war or peace, according to circumstances. They may rather be classed with provisions and foodstuffs of ordinarily innocent use, but which may become absolutely contraband of war when actually and especially destined for the military or naval forces of the enemy."

WHAT IS REAL CONTRABAND?

In the war between the United States and Spain, the navy department, general orders, No. 492, issued June 20, 1898, declared, in article 19, as follows:

The term contraband of war comprehends only articles having a belligerent destination. Among other articles absolutely contraband it declared ordnance, machine guns, and other articles of military or naval warfare. It declared as conditionally contraband "coal, when destined for a naval station, a port of call, or a ship or ships of the enemy." It likewise declared provisions to be conditionally contraband "when destined for the enemy's ship or ships, or for a place that is besieged."

The above rules as to articles absolutely or conditionally contraband of war were adopted in the naval war code, promulgated by the navy department, June 27, 1900.

WHEN FOOD IS CONTRABAND.

While it appears from the documents mentioned that rice, foodstuffs, horses, beasts of burden, and other animals which may be used in time of war are declared to be contraband of war only when they are transported for account of or in destination to the enemy, yet all kinds of fuel, such as coal, naphtha, alcohol, are classified along with arms, ammunition, and other articles intended for warfare on land or sea.

The test in determining whether articles ancipitis usus are contraband of war is their destination for the military uses of a belligerent. Mr. Dana in his "Notes to Wheaton's International Law" says:

"The chief circumstance of inquiry would naturally be the port of destination. If that is a naval arsenal or a port in which vessels of war are usually fitted out, or in which a fleet is lying, or a garrison town, or a place from which a military expedition is fitting out, the presumption of military use would be raised, more or less strongly, according to the circumstances.

BRITISH POSITION OUTLINED.

"In the wars of 1859 and 1870 coal was declared by France not to be contraband. During the latter war Great Britain held that the character of coal depended upon its destination, and refused to permit vessels to sail with it to the French fleet in the North Sea. Where coal or other fuel is shipped to a port of a belligerent, with no presumption against its pacific use, to condemn it as absolutely

contraband would seem to be an extreme measure."

RUSSIAN VIEW HAS CHANGED.

Mr. Hall, international law, says:

"During the West African conference in 1884 Russia took occasion to dissent vigorously from the inclusion of coal amongst articles contraband of war, and declared that she would categorically refuse her consent to any articles in any treaty, convention, or instrument whatever which would imply its recognition as such.

RAW COTTON NOT CONTRABAND.

"We are also informed that it is intended to treat raw cotton as contraband of war. While it is true that raw cotton could be made up into clothing for the military uses of a belligerent, a military use for the supply of an army or garrison might possibly be made of foodstuffs of every description which might be shipped from neutral ports to the non-blockaded ports of a belligerent.

"The principle under consideration might, therefore, be extended so as to apply to every article of human use, which might be declared contraband of war simply because it might ultimately become in any degree useful to a belligerent for military purposes.

"Coal and other fuel and cotton are employed for a great many innocent purposes. Many nations are dependent on them for the conduct of inoffensive industries, and no sufficient presumption of an intended war-like use seems to be afforded by the mere fact of their destination to a belligerent port.

CANNOT RECOGNIZE PRINCIPLE.

"The recognition, in principle, of the treatment of coal and other fuel and raw cotton as absolutely contraband of war might ultimately lead to a total inhibition of the sale by neutrals to the people of belligerent states, of all articles which could be finally converted to military uses. Such an extension of the principle of treating coal and all other fuel and raw cotton as absolutely contraband of war simply because they are shipped by a neutral to a non-blockaded port of a belligerent would not appear to be in accord with the reasonable and lawful rights of a neutral commerce."

COST OF MILITARY PREPAREDNESS.

It takes nowadays years of peace to prepare for a year of war, and the work of preparation is more costly than of old. Major General Corbin, speaking at the reunion of the Seventy-ninth Ohio Volunteer Infantry, in which he served during the Civil War, said a year must elapse after an order has been given for six-inch guns for seacoast defenses before any considerable number can be delivered. The ten-inch guns require fifteen months' time, and the twelve-inch twenty months. It will take, at the present rate of manufacture, about twenty-five years to make the proper amount of reserve fixed ammunition for the heavy guns which will finally be mounted along the American seacoast.

The guns cost from $5,000 to $60,000 apiece. The cost of ammunition a round ranges from $4.25 for the smaller pieces to $440 for the twelve-inch guns. Before the twenty-five years are up some of the heavy ordnance now mounted may become obsolete and have to be thrown away. A nation which wishes to fight to the best advantage must, like the manufacturer who wishes to run his factory to

the best advantage, have a scrap heap, and throw on it guns or machines when better ones are in the market. It will take a great deal of money to keep up with the times, but the money must be spent.

General Corbin says that when the war with Spain, which lasted only a few months and did not call for much preparation, broke out, "the canvas for the tents had to be woven, the wagons for the transportation had to be built, the clothing for the volunteers was at the time wool on the backs of the sheep." In almost every way the country was unready. There was no lack of patriotism, but unarmed, unequipped, untrained patriotism can do little. The country ought not to be again so unready to take the field as it was in the spring of 1898.

Nor is it enough to have stores of guns, ammunition, clothing, and other army supplies. General Corbin says: "The day of volunteers, pure and simple, has passed away, but the day of the trained volunteer soldier has come to remain so long as soldiers are required by us."

LOSS OF LIFE THROUGH WAR.

Professor Charles Richet, the noted apostle of peace, says that during the nineteenth century fourteen millions of human beings died in consequence of war.

"Napoleon," he said, "is usually credited with having caused the death of two million men. As a matter of fact, eight millions of men died for his glory. The war of the Crimea cost 300,000 lives, the American Civil war 500,000, Prussia doomed 800,000 men to death between 1860 and 1871, the Russo-Turkish war 400,000.

"The wars in the South American republics are generally laughed at," said the professor, "but as a matter of fact they are far from ridiculous. In the nineteenth century they cost, all told, 500,000 lives.

"The various European colonizing powers sacrificed during the nineteenth century three millions of men to obtain dominion in British India, South Africa, Mexico, the Dutch Indies, China, Japan and other places. The estimate of fourteen millions of men lost embraces only those who were actually killed on the so-called 'field of honor' and those who died in hospitals in consequence of wounds received. Add to these fourteen millions the sum of misery caused by illness due to war and by death due to economic conditions, fire and violence of all sorts."

The professor concluded: "I am sorry to say that the twentieth century bids fair to rival the nineteenth century in wholesale manslaughter."

LOSS OF LIFE BY ANCIENT AND MODERN WEAPONS.

Terrible as is the destructive power of modern rifles and artillery, the loss of life in battles of today is nevertheless but small as compared with the losses in the days of the battle-ax and the long-bow. In the sixteen hours' struggle against Russian artillery at Nanshan the Japanese lost only 4,000 men out of 60,000, and of these only 750 were killed. At Colenso in the Boer war the British losses were only 1,100 out of 25,000.

Compare this, for example, with the battle of Agincourt in 1415. Fourteen thousand Englishmen overthrew 50,000 French in three hours. The French

View of hallway in typical modern city jail after the prisoners are locked in their cells.

losses were 10,000 dead and two or three times that number of wounded. At Crecy in 1346 the English, numbering 30,000, again proved the effectiveness of their long-bows on 120,000 French, whose losses were 1,200 knights, 1,400 esquires and 34,000 men, the number killed outright being no less than 30,000. At Poitiers the French army of 60,000 had 11,000 killed. At Hastings 30,000 men fell on both sides and at Bannockburn 38,000.

It was the close fighting in the old days that made the battle so destructive of life. The long-bow's greatest effective range was not over 1,200 feet, and when armies clashed a commander had little chance to recognize his enemy's superiority in time to save himself, and no chance at all to disentangle his men, even if he saw his doom.

CAUSE OF JAPAN'S WARS WITH CHINA AND RUSSIA.

The war between China and Japan was provoked by the efforts of the latter government to control Korea, and in 1895 Japan demanded, among other things, as the price of peace, the cession of the Liaotung Peninsula, the tip end of Manchuria, including the naturally fortified promontory of Port Arthur, which commands the entrance to the Gulf of Pechili, upon which Tientsin, Peking and other important Chinese cities are situated. China consented to the transfer of this territory, but Russia interfered, and, with the support of Germany and France, compelled Japan to restore it on the pretext that the peace of the world and the equal rights of all nations in China prohibited so important a strategical point to be controlled by a single nation. Thus, with the aid of Germany and France, Russia compelled Japan to evacuate Port Arthur, and relinquish her claims to the Liaotung Peninsula. Japan, exhausted by her struggle with China, had no choice but to submit. The feeling of her government and her people may be imagined when Russia stepped in immediately afterward and took possession of the territory she had evacuated, and planted guns upon the fortifications she had erected.

RUSSIAN AGGRESSION.

Then Russia demanded of China a right of way for a railroad across Manchuria and the practical permanent possession of Port Arthur as a reward for having forced Japan out. By way of saving the situation in some measure, Japan demanded a guarantee that neither Port Arthur nor any other portion of Manchuria should ever be ceded or leased to or occupied by any foreign power. France and Germany notified Japan that if she pressed such a demand it would meet with their displeasure, and Count Cassini, now minister to Washington, who was then representing Russia at Peking, succeeded in persuading and intimidating China into a secret treaty in which Russia was granted permission to occupy the entire territory of Manchuria, including that from which Japan had been ejected, not only with a railway, but with troops and fortifications. In other words, Russia secured by intrigue much more than Japan had ever demanded as the right of conquest.

JAPAN ROBBED OF RIGHTS.

Japan was unjustly deprived of rights fairly acquired and conceded by China,

and she would not have submitted but for the attitude of Germany and France. Both nations, having similar designs upon Chinese territory, were anxious to have Russia establish a precedent for their benefit. When Japan moved out of the Liaotung Peninsula Russia moved in, still supported by Germany and France. China, helpless, could not even remonstrate. Japan bitterly realized the injustice and wrong, but maintained an honorable and dignified attitude and proceeded to double her army, treble her navy, accumulate ammunition, erect arsenals at convenient points throughout her territory, and build fortifications along her coast, for it was written in the book of fates years ago that there should be war between the Japanese and the Muscovites.

There was an ancient feud smoldering; an ancient wrong unredressed, and a resentment which had been bravely suppressed for many years, but never extinguished. It grew out of the seizure of the Island of Sakhalien by Russia when Japan was too feeble to defend her rights.

Sakhalien lies north of Japan, along the coast of Siberia, and for ages its shores have been a valuable fishing ground for the Japanese. It is a bleak, barren mass of rocks, with a most inhospitable climate and a scanty population of squatters living without a government. But these squatters were all Japanese subjects and the island had always been considered a part of the Japanese Empire. It so appeared upon the Russian maps. But its location with relation to Vladivostok made its occupation by Russia expedient, and, without consulting Japan, China, Korea, or any other neighbor, Russia calmly moved over, took possession, erected fortifications and prisons and made Sakhalien a convict colony. At that time Japan had no navy and her army was not organized for foreign fighting. She was a hermit; she had not been initiated into the society of nations; she had no diplomatic representatives at the European capitals, and she was coolly robbed of a large territory just as impotent nations have been robbed many times before. While she was compelled to submit she has not forgotten and all these years her people have been waiting for an opportunity for revenge.

The United States and Great Britain united with Japan in supporting China against the exorbitant demands of Russia, and, for some reason never explained, the latter was induced to sign a treaty agreeing to withdraw her troops from Manchuria in three installments. Each step of evacuation was to take place upon a fixed date, and through the United States ambassador at St. Petersburg and the Russian ambassador at Washington the czar's government repeatedly renewed the assurance that it would fulfill the engagement. But when the 1st of October 1903 arrived, the date of evacuation, Russia behaved exactly as if no promise had ever been given, and instead of withdrawing her troops and abandoning her fortifications, as she had agreed to do, her minister at Peking demanded additional concessions, which practically amounted to the transfer of the entire territory of Manchuria from China to the czar. Great Britain and the United States made representations which were never satisfied, and Japan decided to bring matters to a crisis.

JAPANESE DEMANDS.

A guarantee of the security of Japanese interests in Manchuria was demanded and Baron Komura, minister of foreign relations at Tokio, submitted a new series of propositions which pledged Russia and Japan jointly to protect the independence and integrity of both China and Korea. It provided that Russia should practically exercise a protectorate over Manchuria and Japan over Korea, with a neutral zone extending fifty kilometers on either side of the boundary between Manchuria and Korea, into which neither should ever introduce troops.

Forty-one days later Baron Rosen, the Russian minister at Tokio, handed a reply to the foreign office which accepted Japan's propositions concerning Korea, but contained no reference to Manchuria whatever. This was a bold denial of Japan's right to be consulted in Chinese affairs. Baron Komura informed Russia that his government could not accept such a reply; it was not admissible. The object of Japan in proposing a new treaty was to secure the recognition of her rights in Manchuria and the protection of her interests there; and to secure a guarantee of the integrity of Chinese territory, and he hinted significantly that "further delay in the solution of those questions will be extremely disadvantageous for both countries."

RUSSIAN POLICY OF DELAY.

That communication reached Russia January 13, 1904, but received no attention. January 23 Mr. Kurino asked for an answer. He repeated the request one week later, and again at the end of the second week, when Count Lamsdorf, the Russian minister of foreign relations, expressed his regret that it was impossible to fix a date for Russia's reply. That was a diplomatic way of explaining that none would be given; that the claims of Japan to be consulted concerning Manchuria were denied; that her pretensions were not admitted. In the meantime, realizing that Russia was hastening preparations for hostilities, Mr. Kurino was instructed to retire from St. Petersburg, and on the 5th of February war was declared.

NATIONAL EXPANSION AND PROPHECY.

Prof. Karl M. Lambrecht of the University of Leipzig, says that heretofore it has been generally held that a nation expanding by acquiring colonies and foreign territory with foreign tribes and populations is lessening its inherent compactness and strength, as by so doing not only does it lose that part of its home population which emigrates to settle the new territories, but these new branches will eventually part from the parent stem.

The professor maintains that this belief is erroneous; that a nation to become great requires space and expansion. Though the new territories and their populations will, in the course of their development, owing to geographical and other causes, present features and traits of character somewhat different from those of the mother country, nevertheless the nation will gain in strength and world influence.

GROWTH OF AMERICA.

Professor Lambrecht, in support of his theory, points to England and the United States, they having by their expansive movements brought about a centralization and unification of various countries and peoples, increasing immensely thereby their inherent strength and their power as world motors, making the English language the chief method of communication over the globe and representative of the world's progressiveness. In the exposition of his views the professor calls attention specifically and at length to the development of the United States and exclaims: "Has the immense territorial expansion of the great republic weakened or suppressed its political life? By no means; on the contrary, each state or territory added or annexed has added nutrition and has given a higher plane to the nation's political life."

The concluding passage of the professor's essay advises his countrymen to emulate the example given by the United States and England, and he indulges in the hope that Germany will use all means in order to obtain a necessary amount of sunlit space; that is, a good slice of foreign territory, for purposes of expansion and centralization, as elucidated in his essay.

GERMANY'S COAST LINE.

Germany at the present time has too limited a coast line to become a great sea power. Her few ports could be too easily bottled up by blocking fleets for her to accomplish anything against a great naval power, and therefore it must be expected that unceasing exertions will be made to acquire other outlets. Holland, Denmark, Sweden and Norway are possible subjects for German expansion so as to acquire sea room. But any attempt on these countries will mean war, and that is something not to be considered at this time. But after the Russo-Japanese war in all probability the prestige of Russia as a great power may be so much impaired as to lead to new adjustments of international relations and of the political powers of Europe. An alliance between Russia and Germany to alter the status of the nationalities around the Baltic and North seas and of those around the Black sea and the Dardanelles might be the prelude to startling changes in the affairs of Europe. Apparently Russia is going most seriously to need an alliance that can be depended on in strenuous conditions, while Germany will find such a connection with her great eastern and northern neighbor the most desirable that can be secured. The recent rapprochement between England and France and the defeat of Russia in Asia seem to have combined to weaken the bonds of the Russo-French alliance which was so eagerly entered into a few years ago.

GOVERNMENT CIVIL SERVICE.

The civil service and its operations are interesting alike to the aspiring student and the tax-paying voter. The government of the United States is the largest direct employer of skilled service in the world. This service is so regulated by law that a position once secured is for life, and promotion is reasonably rapid.

A letter to the United States Civil Service Commission, Washington, D. C., will have prompt answer with full printed information upon anything asked for within its jurisdiction. The following are the principal general facts as to first requirements:

OFFICERS.

Three commissioners are appointed by the president to assist him in classifying the government offices and positions, formulating rules and enforcing the law. Their office is in Washington, D. C. The chief examiner is appointed by the commissioners to secure accuracy, uniformity and justice in the proceedings of the examining boards. The secretary to the commission is appointed by the president.

GENERAL RULES.

The fundamental rules governing appointments to government positions are found in the civil-service act itself. Based upon these are many other regulations formulated by the commission and promulgated by the president from time to time as new contingencies arise. The present rules were approved March 20, 1903, and went into effect April 15, 1903. In a general way they require that there must be free, open examinations of applicants for positions in the public service; that appointments shall be made from those graded highest in the examinations; that appointments to the service in Washington shall be apportioned among the states and territories according to population; that there shall be a period (six months) of probation before any absolute appointment is made; that no person in the public service is for that reason obliged to contribute to any political fund or is subject to dismissal for refusing to so contribute; that no person in the public service has any right to use his official authority or influence to coerce the political action of any person. Applicants for positions shall not be questioned as to their political or religious beliefs and no discrimination shall be exercised against or in favor of any applicant or employe on account of his religion or politics. The classified civil service shall include all officers and employes in the executive civil service of the United States except laborers and persons whose appointments are subject to confirmation by the senate.

EXAMINATIONS.

These are conducted by boards of examiners chosen from among persons in government employ and are held twice a year in all the states and territories at convenient places. In Illinois, for example, they are usually held at Cairo, Chicago and Peoria. The dates are announced through the newspapers or by other means. They can always be learned by applying to the commission or to the nearest postoffice or custom house. Those who desire to take examination are advised to write to the commission in Washington for the "Manual of Examinations," which is sent free to all applicants. It is revised semi-annually to January 1 and July 1. The January edition contains a schedule of the spring examinations and the July edition contains a schedule of the fall examinations. Full information is given as to the methods and rules governing examinations, manner of making application, qualifications required, regulations for rating examination papers, cer-

tification for and chances of appointment, and as far as possible it outlines the scope of the different subjects of general and technical examinations. These are practical in character and are designed to test the relative capacity and fitness to discharge the duties to be performed. It is necessary to obtain an average percentage of seventy to be eligible for appointment, except that applicants entitled to preference because of honorable discharge from the military or naval service for disability resulting from wounds or sickness incurred in the line of duty need obtain but sixty-five per cent. The period of eligibility is one year.

A novel feature in the Royal Military Tournament, London, England. "Push-ball" on horseback. The black horses not only have no fear of the immense ball, but having learned that contact with it will do them no harm they even seem to enjoy the fun of shoving it about with chests and knees, and occasionally opposing it with their hindquarters. The admirable horsemanship of the riders is, of course, mainly conducive to the success of this new sport.

QUALIFICATIONS OF APPLICANTS.

No person will be examined who is not a citizen of the United States; who is not within the age limitations prescribed; who is physically disqualified for the serv-

ice which he seeks; who has been guilty of criminal, infamous, dishonest or disgraceful conduct; who has been dismissed from the public service for delinquency and misconduct or has failed to receive absolute appointment after probation; who is addicted to the habitual use of intoxicating liquors to excess, or who has made a false statement in his application. The age limitations in the more important branches of the public service are: Post-office, 18 to 45 years; rural letter carriers, 17 to 55; internal revenue, 21 years and over; railway mail, 18 to 35; lighthouse, 18 to 50; life-saving, 18 to 45; general departmental, 20 and over. These age limitations are subject to change by the commission. They do not apply to applicants of the preferred class. Applicants for the position of railway mail clerk must be at least 5 feet 6 inches in height, exclusive of boots or shoes, and weigh not less than 135 pounds in ordinary clothing and have no physical defects. Applicants for certain other positions have to come up to similar physical requirements.

METHOD OF APPOINTMENT.

Whenever a vacancy exists the appointing officer makes requisition upon the civil-service commission for a certification of names to fill the vacancy, specifying the kind of position vacant, the sex desired and the salary. The commission thereupon takes from the proper register of eligibles the names of the three persons standing highest of the sex called for and certifies them to the appointing officer who is required to make the selection. He may choose any one of the three names, returning the other two to the register to await further certification. The time of examination is not considered, as the highest in average percentage on the register must be certified first. If after a probationary period of six months the name of the appointee is continued on the roll of the department in which he serves the appointment is considered absolute.

REMOVALS.

No person can be removed from a competitive position except for such cause as will promote the efficiency of the public service and for reasons given in writing. No examination of witnesses nor any trial shall be required except in the discretion of the officer making the removal.

SALARIES.

Entrance to the departmental service is usually in the lowest grades the higher grades being generally filled by promotion. The usual entrance grade is about $900, but the applicant may be appointed at $840, $760 or even $600.

MILITARY EDUCATION.

The United States Military Academy at West Point was founded in 1802. Each Congress district and territory, the District of Columbia and Porto Rico is entitled to have one cadet at the academy. Each state is also entitled to have two cadets at the academy from the state at large. Forty are also appointed from the United States at large. The appointments (except those from the United States at large and from the District of Columbia) are made by the Secretary of War at the request of the senator, representative or delegate in Congress; and the person ap-

pointed must be an actual resident of the state, district or territory from which the appointment is made. The appointments from the United States at large and from the District of Columbia are specially conferred by the President. The appointment of the cadet from Porto Rico is made by the President on the recommendation of the resident commissioner from Porto Rico. The number of students is thus limited to 522.

Appointments are required by law to be made one year in advance of date of admission, and may be made either after competitive examination or given direct, at the option of the representative. For each candidate appointed there may be nominated two alternates, who will be examined with the regular nominee, and one of whom may be admitted in the event of the latter's failure to pass the prescribed preliminary examinations. Appointees to the Military Academy must be between seventeen and twenty-two years of age at date of admission, at least five feet three inches in height, weigh 100 pounds, be unmarried, free from any infectious or moral disorder, and, generally, from any deformity, disease or infirmity; must be well versed in reading, in writing, including orthography, in arithmetic, and have a knowledge of the elements of English grammar, of descriptive geography (particularly of the United States), and of the history of the United States. The course of instruction requires four years, and is largely mathematical and professional.

REMUNERATION.

The pay of a cadet is $500 per year and one ration per day, or commutation therefor at thirty cents per day. The total is $609.50, to commence with his admission to the Academy. The actual and necessary traveling expenses of candidates from their homes to the Military Academy are credited to their accounts after their admission as cadets. There is no provision for paying the expenses of candidates who fail to enter and they must be prepared to defray all their own expenses.

No cadet is permitted to receive money, or any other supplies, from his parents, or from any person whomsoever, without the sanction of the superintendent. A most rigid observance of this regulation is urged upon all parents and guardians, as its violation would make distinctions between cadets, which it is the especial desire to avoid; the pay of a cadet is sufficient, with proper economy, for his support. A deposit of $100 must be made, on entrance, to cover the cost of outfit for uniform. Each cadet must be provided with specified clothing, toilet articles, blankets, etc.

When any cadet of the United States Military Academy has gone through all its classes and received a regular diploma from the academic staff, he may be promoted and commissioned as a second lieutenant in any arm or corps of the army in which there may be a vacancy and the duties of which he may have been judged competent to perform; and in case there shall not at the time be a vacancy in such arm or corps, he may, at the discretion of the President, be promoted and commissioned in it as an additional second lieutenant, with the usual pay and allowances of a second lieutenant, until a vacancy shall happen.

NAVAL EDUCATION.

The students of the Naval Academy are styled midshipmen. Two midshipmen are allowed for each senator, representative and delegate in Congress, two for the District of Columbia, and five each year from the United States at large. The appointments from the District of Columbia and five each year at large are made by the President. One midshipman is allowed from Porto Rico, who must be a native of that island. The appointment is made by the President, on the recommendation of the governor of Porto Rico.

The Congressional appointments are equitably distributed, so that in regular course each senator, representative and delegate in Congress may appoint one midshipman during each Congress. After June 30, 1913, each senator, representative and delegate in Congress will be allowed to appoint only one midshipman instead of two.

The course for midshipmen is six years —four years at the academy, when the succeeding appointment is made, and two years at sea, at the expiration of which time the examination for final graduation takes place. Midshipmen who pass the examination for final graduation are appointed to fill vacancies in the lower grades of the line of the navy and of the Marine Corps, in the order of merit as determined by the Academic Board of the Naval Academy.

METHOD OF NOMINATION.

The Naval Appropriation Act of March 4, 1903, prescribed this method of nominations: "The Secretary of the Navy shall as soon as practicable after the fifth day of March in each year notify in writing each Senator, Representative and Delegate in Congress of any vacancy which may be regarded as existing in the state, district or territory which he represents, and the nomination of a candidate to fill such vacancy shall be made upon the recommendation of the Senator, Representative or Delegate. Such recommendation shall be made by the first day of June of that year, and if not so made the Secretary of the Navy shall fill the vacancy by the appointment of an actual resident of the state, district or territory in which the vacancy exists, who shall have been for at least two years immediately preceding his appointment an actual bona fide resident of the state, district or territory in which the vacancy exists and shall have the qualifications otherwise prescribed by law.

"And provided further, that the Superintendent of the Naval Academy shall make such rules, to be approved by the Secretary of the Navy, as will effectually prevent the practice of hazing; and any cadet found guilty of participating in or encouraging or countenancing such practice shall be summarily expelled from the academy, and shall not thereafter be reappointed to the corps of cadets or be eligible for appointment as a commissioned officer in the army or navy or marine corps until two years after the graduation of the class of which he was a member."

Candidates allowed for Congressional districts, for territories and for the District of Columbia must be actual residents

of the districts or territories, respectively, from which they are nominated. All candidates must, at the time of their examination for admission, be between sixteen and twenty years old.

CONTRACT ON PAY.

Before entering the Academy the appointee must sign an agreement to serve in the navy eight years, including his time of probation at the Naval Academy, unless sooner discharged.

The pay of a midshipman is $500 a year, commencing from the date of admission. The expenses attending equipment at entrance are $226.35. A preliminary deposit of $30 for clothing is required on entering the Academy.

MANUFACTURING PAPER MONEY AND STAMPS.

The government and the banks, and even the postoffices, would be in a hole for a time if all the women in the bureau of engraving and printing should drop dead all at once. That shop would have to close up pretty quick. Why, you can't even go over there and look around without a woman to show you. All the guides to the bureau for the benefit of tourists and other ignorant people—which includes all Washington people, for Washington people are the most ignorant people on earth about Washington institutions—all the guides—and there are seven of them—are women, young women and pretty women, at that.

Not so many years ago three decrepit old men were the guides. Now the seven are women, which is significant, and one that typifies the work done in the bureau, for here, of the 3,000 employes, more than half are of the feminine persuasion.

These young and good-looking guides will explain how American money is printed on the back, then put in cold storage, when it goes through a drying process; then sorted and imperfect sheets thrown out; then printed on the face, and then perforated and put up in packages to be sent to the treasury for the government seal.

TIME REQUIRED IN PRINTING.

"It is seven days after a bill is printed on its back before it is printed on the face," said this visitor's guide. "It takes thirty days to make a silver dollar bill and forty to make a gold one. The gold one is printed three times, twice on one side, because it has to have the word 'gold' and a little splotch of gold on this side before the face can be printed."

Then she led the visitor to the framed dollar bills fastened to one of the walls in the hall, and showed these bills, calling special attention to the gold certificate, and then led the way back to the front door and said adieu. It was all over in ten minutes.

But there is one section of the bureau of engraving and printing that the guides do not take you through, unless you have a special permit. This is where they make the postage stamps—the common, ordinary postage stamps that you give only 2 cents for and stick on your letters with a contemptuous lick. But it is the most interesting part of the bureau.

Just think, it takes two days to produce the plate from which that stamp is printed that Uncle Sam allows you to have for the insignificant sum of 2 cents!

And, what is more, this work is all done by skilled artisans. As a general thing, three engravers have worked on the pattern that makes the decoration of the finished stamp. One, with the edged tool of his art, makes the incisions for the head. Another does some of the ornamental scroll work, and a third completes what is left to be done. At this stage of its manufacture the stamp is called a die.

The process by which this die is transformed to a plate of metal on which it is stamped 400 times, and from which the sheet of stamps is printed is a matter not for the comprehension of the average unscientific mind. But, at any rate, this transformation occurs, and it is this that requires the two days' work.

There is method in this subdivision of the work, besides that of letting each man have his specialty. No employe becomes proficient in the complete manufacture of a stamp, and thus he cannot work overtime at home making them for his own use or for a little industry of his own on the side.

When these plates are taken from the engravers, the real work of printing the stamps begins. It takes one inanimate and three human machines to operate four of these plates. A woman is feeder. She takes the plate that has been carefully polished by a man who stands at her left and lays over this the specially prepared paper upon which the stamps are to be printed.

METHOD OF PRINTING.

She pushes the plate under a roller that, by its pressure, transfers the pattern of stamp on the plate to the paper. She is then ready for the second plate. The girl directly opposite her, who can sit down at her work, takes the sheet of stamps from the plate and pushes the latter under another roller of the machine, where it is re-inked for another impression. This work goes on from 8 o'clock in the morning until 4 in the afternoon and the machinery is generally hot.

In a room above, the sheets of stamps receive their coating of glue on the back. There are eight electric machines to do this work, and each of these requires the assistance of three young women. One feeds the machine, sending the sheet under the roller with its printed side downward that the smooth backs may be exposed to the drippings of the glue that fall from a metal receptacle just over the roller.

Continually moving machinery carries the sheet on into the drying box. This is 50 feet long and filled with hot air. Across the ceiling of this room is a big aluminum pipe which connects with these boxes by means of perpendicular pipes. This is some sort of an apparatus by which all the moisture in these boxes is drawn out. On an ordinarily cool summer day the atmosphere of this room is 100 degrees Fahrenheit.

By the time you have followed this drying process the length of these fifty feet you reach the other end of the room, where the two other women assistants are at work. One of these takes the sheets from the machine and the other makes a neat pile of them. At a table in one corner of this room sit the counters, who inspect all work before it is allowed to go out into the next room, where it is perforated.

USE OF THE MACHINES.

Each machine in the perforating room requires two girls for its operation. One of them works the machine with her foot. When she sends a sheet through the machine it is perforated and cut in two sections. In another machine these halves are cut in two, thus quartering the original sheet. These quarters of the original sheet are put up into packages of from 100 to 500 sheets, or from 1,000 to 5,000 stamps, and sent direct to postoffices all over the country.

Before the days of rural delivery 77,000 postoffices were served daily. But this improvement in the mail service has cut the number down to 74,000. The number of stamps sent out daily is 15,000,000. When you hold up to the light a sheet of paper on which the stamps are printed, it shows a water mark consisting of the letters "U. S. P. S." Over each of these letters a stamp is printed.

It is sometimes said that the young woman who holds a government position knows nothing of really hard work when she labors only from 9 to 4:30, has a month's vacation with pay in the summer time, and is allowed one month during the course of the year in which to remain at home on account of illness. In contrast to her, the stenographer in a private institution or the clerk in a store is cited, the latter having to work much longer hours, and, as a general thing, receiving a lower salary.

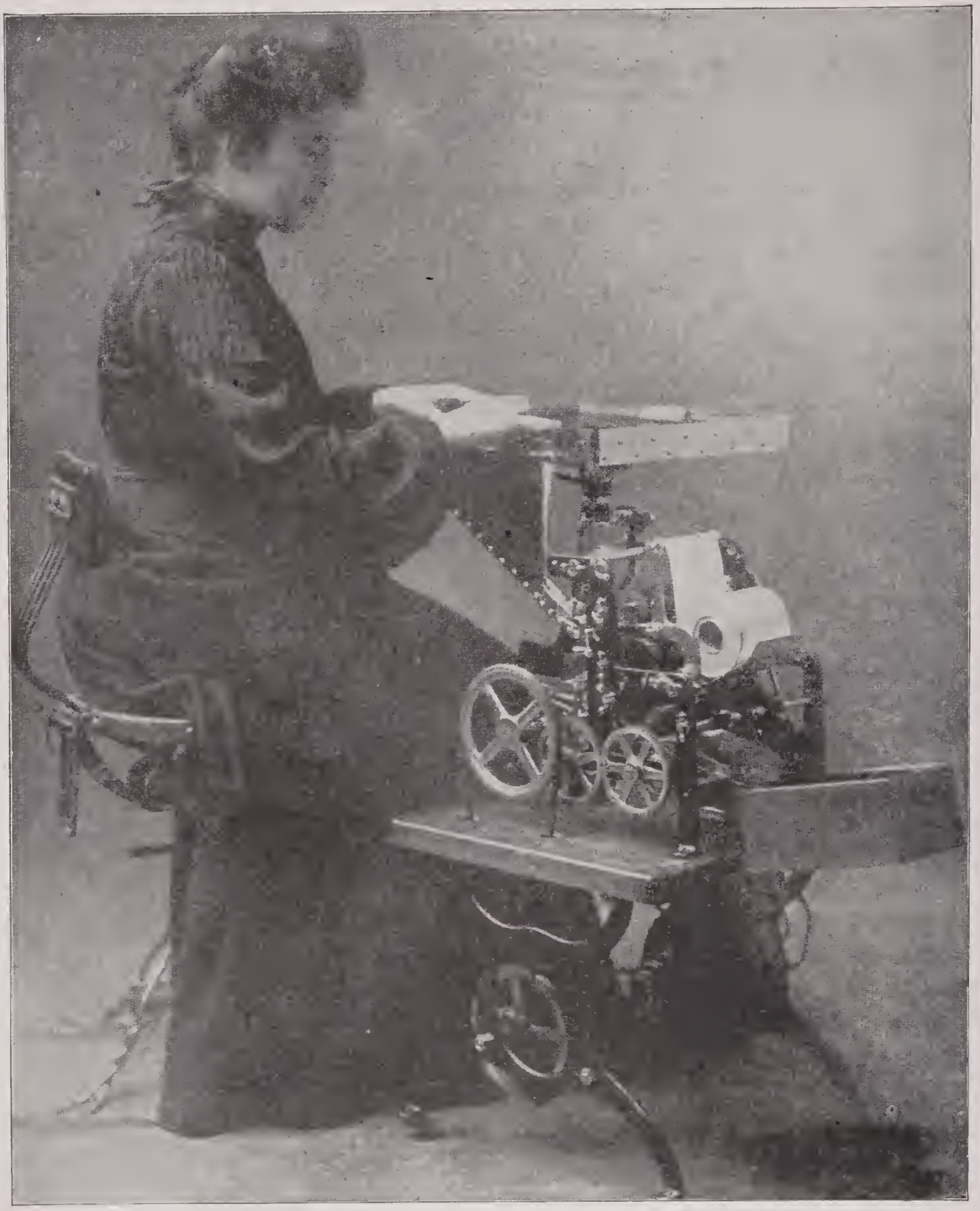
If this is true of some government clerks, the condition is certainly overbalanced by the young women who spend their working days at the Bureau of Printing and Engraving. The hours are from 8 to 4, but that is quite long enough considering the nature of the work done there.

During those hours the clerks sit at machines puffing out heat and fumes of impurity. On the floor where the money is printed each machine is operated by both men and women. The women hand out the sheets and take them again after they have been through the printing process. They do not have actually to touch the machines, but they cannot keep out of all contact with the printer's ink and grease that is all around them, and they are all day long in an atmosphere of heat, intensified by the row of gas stoves between the machines.

The girls who work at the machines in other parts of the building can vary the monotony of their work by first sitting down to it and then standing up. And when there are two girls at one machine they can alternate at each other's posts, and in this way distribute their aches and pains to both sides of their bodies. But man-made machines, though automatically run, are grinding affairs and demand constant attention.

HOW THE GOVERNMENT COINS MONEY.

The round metal disks, properly shaped to the right size, are dropped into a tube that is exactly designed to receive them. At the base of the tube, sliding horizontally and visible, are a pair of long, flat, fingerlike grippers which close on the lowermost disk with a click. The fingers then slide inward about six inches and re-



A machine in the government service that counts and wraps twenty-five thousand coins in an hour.

lease their burden, depositing it precisely in a certain spot with an accuracy that reckons within a hair's breadth.

Then the fingers retreat. At the instant two peculiar-looking great bulbs of steel, which the wise ones call a "toggle joint," wabble together, and down from above with 160 tons pressure comes the die. Below is another die or stamp, the reverse side, behind which also is fabulous power. To the thousandth of a second, the one meets the other. The impressions of the lettering and figures are made upon the disk. It is not mashed, because it is contained by a "collar," pressure against which serves another purpose, in that the milling of the edges that we note upon all coins is accomplished.

THE COINING MACHINE.

Beyond a doubt, a coining machine is a most "intelligent" mechanical device. The click, click, goes on like the ticking of a clock; the fingers pick up coin after coin, never missing, never fumbling, never stopping, doing business at the rate of eighty a minute. Twenty-dollar gold pieces can be turned out at this rate, making $1,600 a minute.

And it is an ugly looking brute of a mechanism to exhibit such a remarkable —prescience, shall we call it? A great, heavy, enormously heavy and bulbous mass of cast iron girds the whole affair. In the middle, somewhat as the head of the turtle sticks out from the shell, protrudes the slender framework which guides the "hands." In slides the frame; shut go the fingers. Out slides the frame; open come the fingers. Each time a coin is stamped. Watch this awhile and you begin to feel somewhat queer—the thing is almost uncanny.

The main prongs, or the "wrists" of the hands, are attached to short bars, which, in turn, are attached loosely to other bars—the ones that have the in-and-out motion. Now, the hand part is supported upon a block of brass, which moves with the sliders, but rests upon strips of wood. The brass, rubbing on the wood, retards the motion, so that the brass block, with its attached prongs, tends to move more slowly than the sliders. The retarding causes the fingers first to grip and then to release the coins.

STORY OF THE MINT.

In 1795 the United States having blossomed out into full-fledged companionship with the nations of the world, Uncle Sam foresaw the necessity of possessing a mint.

The old apparatus is a turn-the-crank affair, and looks like it might be an apple press or something equally rustic. But the contrast vividly tells the story of one hundred odd years.

Hardly less absorbing than the coining is each of the numerous steps through which our metal money passes. Four or five thousand ounces of gold, silver or copper are melted at a time in a naphtha furnace, which generates 1900 units of heat and which roars like a tornado. The liquid, lifted out in cups, is poured into molds and comes out in sticks about a foot long, one-half inch thick and one inch wide.

The sticks are then compressed in a device which requires fifty-horsepower to operate it. They are run through the press time and again to secure an exact

thickness, which must be, in the case of double eagles, not a jot more nor less than eighty-three one-thousandths of an inch. By an infinitely delicate gauge—a "clock" it is called—the thickness can be regulated up to a thousandth of an inch. The accuracy is necessary in order that the strips from which the coins are to be made shall be of a uniform weight throughout their entire length; in other words, that a $20 piece have in it exactly $20 worth of gold.

The pressing hardens the metal. The strips then must have the first annealing process, which softens the gold. This means passing them under a spray of cold water. Now, all is ready for punching. The strips pass under a punch which is capable of 180 punches a minute, each punch resulting in a disk of precisely the correct diameter.

The punching frays the edges the least bit. This is remedied in what is termed the "up-setting machine." The term is simply a practical expression of what the device does; it turns over these roughened edges and also creates the little border or circle of indentations which we note at the edges upon both sides of every silver or gold coin.

The punching has again hardened the coin beyond its desired consistency. The seventh step of its manufacture, then, is a second annealing. From the "annealing cylinder" it comes out, if gold, a dull brown or blackish color.

Uncle Sam's new double eagles must shine with an undimmed luster, and the eighth process is a cleansing apparatus which cleans by the oxidization of the copper or the alloy metal. After cleansing, the coins must be dried; and a special device, as intricate as any drier in any laundry, is designed to accomplish this purpose. Dried, they are ready for the coiner.

SIGNALS OF THE SEA.

Among those objects that instantly find the eye upon entering any exhibit of government works are the huge globular devices of tiered strips of fine glass, in which the sunlight breaks into many miniature rainbows for the equipment of Uncle Sam's lighthouses. Exactly such complicated lamp-lenses are important features of the beacons which are both the seaman's safety and a valuable insurance to our merchant marine.

But they do represent a practical application of scientific discoveries concerning the nature of light rays. By the concentration of the light, by its refraction from one glass plane to another, it finally is projected through a bull's-eye, intensified in some cases 200 per cent.

In a lamp of the "second order," which burns kerosene and has 480-candle power, the flashes which warn the sailor far out at sea possess 182,000-candle power. In a lamp of the "third order," a kerosene flame of 240-candle power becomes magnified to 65,000-candle power. In a lamp of the "first order," for which the central light is furnished by electricity, the resultant candle power—one such light shines out from the New Jersey coast—amounts to 385,000-candle power. The degrees of intensity are signified by this word "order" in lighthouse terminology,

and they form a descending scale down to those having only a few thousand candle power.

In their form the lamps are many-sided, cylindrical. In general character nearly all are alike, varying only in size, excepting the few in which electricity is used.

One division among them can be made, however, as between those designed to provide a continuous light and those that are flash lights.

CONTINUOUS LIGHTS.

The example of a continuous light is one of the largest in use, and with a lamp of 480-candle power it projects rays of 8,000-candle power. At the centre of its sheath is a belt of glass thicker and wider than the others, and at which the highest luminosity is secured. Above and below, encircling the lamp, are series of long triangular prisms, each set at a slightly different angle, so that the light rays striking upon them are reflected into the main belt of the glass, where they are given the final horizontal projection. To obtain such results, it will be readily understood that the nicest care and calculation is required in placing the glass strips.

The problem seems complicated enough when applied to a light such as that just described. But, with the flash or bull's eye lamps, the mathematical difficulties are almost infinitely multiplied. Every single light ray thrown off by the lamps is carried through a series of refractions, bounding from one surface to another, until all are hurled forth together from the narrow radius of the bull's-eye.

"Captain," you ask, "is not an 8,000-candle power lamp, such as this, visible just as far out at sea as a 182,000-candle power one?"

"Yes, in good weather," he answers. "But one is brighter than the other, and will show up better at a distance. The electric light, of course, is the strongest, but it is not so good in a fog. But when you come down to it, none of them are much use in a fog. Our warning then is chiefly the steam siren; but they even fail of perfect service, since they may be heard at a distance and not heard closer in, as the sound ricochets; they are confusing.

THE SUBMARINE BELL.

"A new invention, now being tried, seems to promise better than anything we have found. It is a submarine bell, which works automatically, and the strokes of which are registered by means of an apparatus on shipboard. I think that the only hope of a sure means of fog signaling lies in some submarine device."

"How about the flash lights? What is the object in having them?"

"A flash attracts attention; it is quickly seen, though I think that the fixed light, judging from my own experience, gives the sailor the greater sense of security. The main purpose of the flashes is to afford a means of identifying the various lighthouses along the coast. For instance, the light at Cape Cod gives two half-second flashes, and then there is an interim of five seconds. The light on the Massachusetts coast is a fifteen-second flash every ninety seconds. Any captain at sea knowing the lighthouse code takes the time of the flashes and he immediately is informed of his whereabouts."

The adjustment of the flashes is accomplished both by the arrangement of the

lenses, and by a clock-work device that turns the entire lamp around.

A lamp such as that at Cape Cod has two bull's eyes, close together, while it has the glass prisms upon only one side. The other side is cut off with opaque curtains. Consequently, as the whole apparatus turns, the light can be seen only when a bull's eye comes within the line of vision. The two eyes are just at that distance apart and are turning at just that speed which permits each flash to continue a half-second, and which causes the two flashes to follow one another after a half-second interval. The five-second interval occurs while the opaque side is facing the sea.

GOVERNMENT EDUCATION OF THE INDIAN.

Nine million one hundred and seventy-two thousand two hundred and seventy-three dollars and ten cents was the amount of money expended last year by the Indian Bureau of the Interior Department. Three million one hundred and sixty-one thousand four hundred and eighty-three dollars and sixty-one cents was expended in the support of the Indian schools. There were 257 schools in operation, and enrolled in all of these schools were 24,357 pupils, with an average attendance of 20,876. There were employed 2,282 persons, of which number 111 were superintendents. All of these people have either been in the Indian service for a long period or were appointed through the medium of the classified Indian civil service.

For the general supervision of these schools five supervisors were appointed. They visit every school in the district assigned to them two or three times each year, going thoroughly into the capacity and effective industry of the personnel of the school, the character and efficiency of the superintendent, and the moral conditions pertaining to the institution. Aside from these supervisors there are five special agents and seven inspectors who look into the general conduct of the schools.

The Indian question is divided into two distinct phases. One, that the American Indian shall remain in the country as a survival of the aboriginal inhabitants, a study for the ethnologist, a toy for the tourist, and a continual pensioner upon the bounty of the people; the other, that he shall be educated to work, live, and act as a reputable, moral citizen, and thus become a self-supporting, useful member of society.

VALUE OF EDUCATION.

To educate the Indian in the ways of civilized life is to preserve him from extinction, not as an Indian, but as a human being. As a separate entity he can not exist. The pressure for land must diminish his reservation to areas within which he can utilize the acres alloted to him, so that the balance may become homes for white farmers. To educate the Indian is to prepare him for the abolishment of tribal relations, to take his land in severalty, and in the sweat of his brow and by the toil of his hands to carve out a home for himself and family.

Practical education is what he most

needs—the knowledge of how to make a living, even under adverse circumstances. The first step is the acquirement of the English language. Without it he is powerless to transact intelligently the ordinary affairs of life, to dispose of the products of his farm, or the increase of his herds. Indian schools are, therefore, limited in text-book instruction to the ordinary common school branches.

It is argued that the Indian should be taught the rudiments of the language, taught to work, and sent home with the understanding that he must work or starve. Officials who have studied the question say that this system will, in a generation or two, regenerate the race. It will exterminate the Indian, but will develop the man. They say, protect him only in so far that he may gain confidence in himself, and let nature and civilized conditions do the rest.

IMPROVEMENT IN THE SCHOOLS.

The Indian school of the present is not what it was a generation ago. Mistakes are being corrected, and, while the system is still imperfect, the schools are striving hard to raise the Indian character and prepare the young generation for the time when the parental hand of the government must be taken away.

The question as to what will become of the children of the five civilized tribes in the Indian Territory is bothering the officials in the interior department, and it is not unlikely that, in the near future, some plan will be adopted for their future education. Within the next three years, under the agreements, tribal government must cease, their affairs be settled up, and the tribal funds be distributed pro rata. Under present laws, public schools can be organized only in incorporated cities and towns. For the rural districts and many towns no adequate public school system can be established for the Indians and whites. With tribal government extinguished and money distributed to the Indians per capita, the question arises as to where the money will come from to support Indian schools. These nations are now rich, but it is a question whether they will be ten years hence. The status of the thousands of negro children is also of importance. They are now in separate schools in the Cherokee and Creek nations, but the Choctaw and Chickasaw nations do not permit them to share in their school fund.

THE MOST ADVANCED OF THE INDIANS.

The Indians of the Cherokee nation are probably the most enlightened of the five civilized tribes. Last year 160 teachers were employed in their primary schools. The Cherokees came from Georgia and vicinity, and settled on lands patented to them in 1840. It is an interesting fact that before the adjoining states were taken into the Union, these people had adopted a constitution making officials elective, abolishing polygamy and recognizing the Christian religion, and had passed strict temperance laws. They were the first Indian tribe to establish a free public school system. Missionaries were welcome, a native alphabet was adopted, and a printing press and newspaper were established by the nation. Separate schools are maintained for Indians and negroes. The Cherokees and negroes do

not intermarry or socially mingle. The total enrollment in the Cherokee schools last year was 6,187, with an average attendance of 3,641. The annual cost was $110,818.

A large percentage of the Creeks are full-blood Indians. They have nine small boarding schools, six of which are exclusively for Creek children, the remaining three admitting negroes. The total enrollment for the past year was 2,557, with an average attendance of 1,350, the cost of maintaining which amounted to $73,358.

The Choctaw nation is larger. They have ten small boarding schools, in which 447 Choctaw children are educated and supported, and 175 day schools, in which 3,068 Choctaw children are being educated. The cost of maintaining these schools amounted last year to $119,561.

The Chickasaw nation falls far short of the showing made by the other nations. The Chickasaws are still allowed to control their own expenditures for school purposes. Their council makes no appropriation for school purposes at the beginning of the year, but permits their school authorities to continue incurring indebtedness, regardless of their ability to pay. Another extravagant feature is apparent in their attempt to pay the board of all the children enrolled in their day schools. In many instances parents are allowed from $10 to $12 a month per child, for boarding their own children. This nation has an average enrollment of 1,193, and an average attendance of 872. It required last year $110,750. A comparison of figures shows that the Chickasaws expended $110,750 upon the education of 1,193 children, while in the Choctaw nation but $119,561 was expended upon the education of 3,998 children.

But the conditions which surround an Indian school are materially different from those of the ordinary white public school. Children in white institutions learning usually come from homes where every moral influence is thrown around them, where their own inherited tendencies are fostered for the uplifting of moral character. They are encouraged by parents, associates and friends, and are thus by nature and environment, as well as by inheritance, stronger to resist temptation than are the Indian children. Pupils in Indian schools are generally kept in these institutions for 24 hours of the day, 10 months a year. The other two months in the year they are returned to their homes in the camp, where they are surrounded by their own people.

Secretary Hitchcock is endeavoring to bring the Indian schools up to the same standard and to throw around the Indian student the same moral influence as is given to the children in the homes and schools of the white children.

NEGRO POPULATION OF THE UNITED STATES.

The United States contains the greatest number of negroes of any country outside of Africa—about nine and a quarter millions. Of these, all except less than three per cent. are in this continent or within the boundaries of the Union as they stood before our insular accessions, and nearly nine-tenths of these continen-

"Despised and Rejected of Men."
Sigismund Goetze's vision of Christ crucified before modern society upon an altar erected "To the Unknown God."

tal negroes are in the Southern States, and more than three-tenths in the three States of Georgia, Mississippi and Alabama.

In from one-ninth to one-sixth of the negroes there is some measure of white blood; but the statistics as to this matter cannot be regarded as accurate, for the fact of the mixture of blood is not easily obtainable by enumerators. Trustworthy, however, is the conclusion that this admixture, as determined, is most prevalent where the negroes, proportionately to the whites, are fewest, and least where they are most numerous. For example: In South Carolina, where nearly three-fifths of the total population is negro, there is the smallest percentage of white admixture; and in Mississippi, where the negroes are nearly as numerous, the admixture is very slight proportionately. In Maine, where in a total population of nearly seven hundred thousand there were only 1,319 negroes in 1900, the mulattoes were about three-fifths. In South Carolina, where there were nearly eight hundred thousand negroes, the proportion of mulattoes was less than a tenth.

The Northern States where negroes are most numerous are these:

	Negroes, 1900.
Pennsylvania	156,845
New York	99,232
Ohio	96,901
Illinois	85,078
New Jersey	69,844
Indiana	57,505
Kansas	52,003
Massachusetts	31,974
Michigan	15,518
Connecticut	15,226

About two-thirds of the negroes are engaged in agriculture, the remainder in many other occupations.

This list of certain employments in which negroes were engaged in 1900 is interesting and suggestive:

Teachers and professors	21,268
Carpenters and joiners	21,114
Barbers	19,942
Clergymen	15,530
Masons	14,387
Dressmakers	12,572
Engineers and firemen	10,227
Blacksmiths	10,104
Boot and shoe makers	4,574
Musicians and teachers of music	3,921
Actors and showmen	2,043
Physicians and surgeons	1,734
Lawyers	728
Bookkeepers and accountants	475
Stenographers and typewriters	395
Artists and teachers of art	236
Dentists	212
Commercial travellers	187
Electricians	185
Architects	52

It is interesting to note that from 1890 to 1900 negro clergymen increased more rapidly than white: negro 27.7 per cent., or from 12,159 to 15,528, and white from 75,972 to 94,437, or 24.3 per cent. Among the negroes the proportion of clergymen in the population is more than among the whites. For each 100,000 negroes there were 171 clergymen, to 141 for the whites. In the South the proportions are 160 negro and 129 white. In the North the relative number of negro preachers is much greater.

In 32 of the cities of the Union there were more than 10,000 negroes in 1900, and their aggregate negro population was nearly a million. Washington was the

city with the largest negro population. It had about seven thousand more than Baltimore and nine thousand more than New Orleans, the greatest of the Southern cities. With the exception of those cities, Philadelphia, with 62,613, and New York, with 60,666, had more negroes than any Southern city. In New York were nearly twice as many negroes as in Richmond; and, we may add, the Virginians in New York, white and negro, were equal in number to more than a quarter of the whole population of the Virginia capital. The percentage of negroes to the population, of course, is far greater in the Southern cities. In Charleston and Savannah they are more than half.

Nine-tenths of the negroes, but only one-fourth of the whites of the Union, lived in the South in 1900 In the North the negro is about as pre-eminently an inhabitant of a city as in the South he is of the country.

From the civil war to 1900 the negro population of the Union about doubled, or in exact figures, increased from 4,441,830 in 1860 to 8,833,994 in 1900. In the Southern States distinctively the increase was from 4,097,111 in 1860 to 7,922,969 in 1900.

THE RACE PROBLEM.

Rev. Mr. Kirbye, president of the Atlanta Congregational Theological Seminary, says: "You hear it constantly that two races can occupy the same territory and mutually sustain themselves. But that is not the lesson of history. Three things have happened when races have come together. If there has been little difference in temperament, color of skin and aspirations, amalgamation has taken place. This is one solution. If one is greatly inferior in civilization and the disparity in color of skin is marked, it has resulted in the destruction of the weaker. The bow and arrow has never been the match of the shotgun. And the third solution is separation.

"Can we learn a lesson as to our relations and duty to the American negro? I have always pleaded for the qualities of justice and brotherhood. But I stand here and anywhere to say that the amalgamation of the negro and the white man of this country is an impossibility. That is agreed. Second, the negro cannot be destroyed. He has imbibed too much of our civilization, and the leverage of leadership from his race will save him from the fate of the American Indian. But so long as large numbers of black people live in the same communities with white people, there will be criminality, conflicting interests and race riot. No section can be so pharisaical now as to say that it is the exception.

WAY TO SAVE THE NEGRO.

"The Christian thing to do is to separate the races if you would save the negro. I do not advocate deportation to Africa, but I do think that the masses of them could be segregated in some specified area to the mutual advantage of all concerned. The government of the United States could set apart by purchase an area of territory in the southern and southwestern part of the country to be known as the Negro State. It should be

impossible for the white man to do business within it, or exercise the rights of citizenship.

"There would be no danger of interference from the white man if he could not do business within the state or hold office. The negro would then be given the fullest opportunity of developing his race life. He could occupy the same relation to the general government as a state. This segregation is not an impossibility. It is the only hope for the negro. The present conditions in this country emphasize the fact that the negro can never expect the fullest social and political recognition from the white man. We cannot give it and save ourselves.

"Christian philanthropy, education and the example of the white man saved him from barbarism and have given him a leadership that equips him to battle for his race life in our American democracy. We can aid him in this struggle only as we encourage segregation which will give him the fullest opportunity of struggling against environment and those inherent tendencies that seek to drag him down."

A REPLY.

Segregation is approved by Rev. J. Edward Kirbye, president of the Atlanta Theological Seminary, as the solution of the race problem, and he anticipates an obvious objection by declaring that it is not impossible. Nevertheless, it seems to call for more than one expedient that is clearly impossible. First, there must be compulsion, and neither state nor federal government has the right to order the negro out of one place and into another. Second, if Mr. Kirbye's plan were followed there would be need of a new state establishment, in which it would be impossible for the white man to do business or exercise the right of citizenship. This is another impossibility. Third, it would be necessary to exercise a power over property that is not found in governments or individuals in order to carve out the requisite territory, and this also is impossible.

Manifestly, therefore, the scheme would not work, though it is suggested in all sincerity. That it is thus sincerely proposed, and that, too, by a southern religious teacher, is indicative of the desperation to which the problem has reduced men's minds in the South. They are simply grasping at chimeras with the idea of getting rid of the negro, when the most that they can do is to assist in his moral and mental development.

MOBS AND LYNCHERS.

A writer in an English magazine a few years ago had occasion to make the following observations: "More than 1,000 men and women have been lynched in the United States during the last ten years. Mob violence is spreading. It is not confined to the district south of Mason and Dixon's line. New York State and the Quaker State have suffered the mob to murder blacks within their borders, and have made no effort to punish the lynchers. In 1882 there were 52 negroes murdered by the mob; in 1892 there were 160. Last year (1893) the number must have reached 200. In South Carolina last year there were thirteen lynched; in Georgia sixteen, in Alabama twenty-seven. The atrocities perpetrated during

the present year justify the opinion that if the remaining eight months maintain the record of the opening four months of the year, 1894 will stand out as the worst year, in point of numbers and blood-thirstiness, since the days of the Kuklux.

"Of these men and women who have been put to death without judge or jury, less than one-third of them have been even accused of criminal assault. The world at large has accepted without question the statement that negroes are lynched only for assaults upon white women. Of those who were lynched from 1882 to 1891, the first ten years of the tabulated record, 269 were charged with rape, 253 with murder, 44 with robbery, 37 with incendiarism, 4 with burglary, 27 with race prejudice, 13 quarrelled with white men, 10 with making threats, 7 with rioting, 5 with miscegenation; in 32 cases no reason was given, the victims were lynched on general principles.

CHARGED WITH VARIOUS CRIMES.

"Of the 171 persons lynched in 1895 only 34 were charged with criminal assault; in 1896, out of 131 persons who were lynched, only 34 were said to have assaulted women; of the 156 lynched in 1897, only 32 were so charged; in 1898, out of 127 persons lynched, 24 were charged with the alleged 'usual crime;' in 1899, of the 107 lynchings, 16 were said to be for crimes against women."

PUBLIC OPINION RESPONSIBLE.

It has been intimated that there is a growing want of respect for the legally constituted authorities in this country. It is argued that the statistics submitted justify the making of this claim. The increase in the number of homicides, annually, during the last decade, and the decrease in the number of convictions for the same, through the courts, go far to sustain that claim. The increasing frequency of the reign of Judge Lynch, practically unmolested, also sustains the same view. The adoption of exceedingly cruel and unusual methods of punishment by the mob, as that of burning the defenseless victims, still further confirms the lawless tendencies of the times. These conditions would not, could not, exist if public opinion did not assure immunity from adequate punishment to the murderous hordes who participate in these lawless and brutal proceedings. We cannot escape the conclusion that the reign of lawlessness is securing a firm hold in this country, is upon us with a strong and relentless grip.

The attorney general of the United States, in a recent report to congress, says that in the last twelve years the number of homicides in this country has risen from 4,000 to 10,500 per annum; that of the number represented by the last figures, in round numbers, 100 were convicted of murder by the courts, and 240 were executed by lynch law. In some of the states this proportion is less; in others it stands three lynchings to one conviction for homicide and rape.

THE TERRIBLE RESULT.

The worst thing about these burnings, these illegal killings, whether they take place in the North or the South, is the dreadful effect upon the minds of the lynchers themselves—especially upon the children.

It has taken thousands of years for men to rise from utter savagery to compara-

tive civilization. It takes but very few years—or only a few weeks—for the civilized veneer to come off—for the man to become the savage once more.

A great crime is committed against the state when the murderer butchers his victim. But a greater crime is committed when the civilizing work and influences of years are destroyed through the murder committed by the mob.

NOVEL TEMPERANCE MOVEMENTS.

The Gothenberg system of liquor restriction, which has been successful in Sweden for many years, is being copied to some extent by the Central Public House Trust Association in England, the purpose of which is to lessen the enormous British expenditure on liquor, which amounts to about $540,000,000 a year. The association operates by organizing local trust companies all over the country, which shall manage public houses, known as Trust Houses, where there shall be no inducement to push the sale of intoxicants as against other drinks, and where the conditions under which intoxicants are sold shall be the healthiest possible in every way, physical and moral.

At the head of the association is Earl Grey, the Bishop of Chester, Mr. Chamberlain and various well-known men are vice-presidents.

Stockholders in the association are not to receive dividends of more than five per cent; all surplus profits are to be spent on local improvements.

The Trust Houses will sell food and non-intoxicating drinks, and the terms of their franchises are such as to render it useless to press the sale of intoxicants as against the temperate beverages or the food, every house being in charge of a manager, who is paid a fixed salary with a commission on all non-intoxicants sold. There is no obligation to sell any one brewer's beer or any one distiller's spirits.

The association has grown rapidly. At the end of 1901 there were 406 subscribing members; in March last, 820. Under trust management in the same month were 130 houses, an increase during one year of forty-eight. Only poor English countries are without Trust Houses. The class of customers at these places is very much better than that at the regular public houses.

ANOTHER EXPERIMENT.

In July, 1904, Bishop Potter, Protestant Episcopal of New York, gave his endorsement and sanctioned by his presence the opening of a saloon there according to his own plans as a model for improved drinking places. It is a club-house for the middle classes where the use of intoxicating liquors is to be severely in restraint and non-intoxicating beverage brought as much into use as possible. A storm of criticism being aroused, he made the following explanation in self-defense:

"My controversy is simply with those who have no other aim in dealing with a mischievous institution than to suppress it, whereas the only hope of reform here is in displacement by substitution.

"And thus, among ourselves, the breach has been widened. On the one side have stood those who, feeling keenly a great evil, have not always been wise in the choice of the instrument with which they have fought, and who have erred, most of all, in imputing unworthy motives and

hurling anathemas against others who differed with them.

"It is hardly necessary to say that temperance reform, as it has most actively obtained in this country, has not obtained either universal sympathy or general co-operation. Besides those whose interests have made them hostile to it, and whose number can only be inadequately estimated, when we remember the enormous pecuniary capital represented by the liquor traffic, there has been a large class which has honestly dissented from those leading positions of total abstinence and legal prohibition upon which the temperance reform has been usually conditional.

"They have resented prohibition as an undue interference with personal liberty,

How the Chinese deal with the Chunchuses: A scene in the prison yard at Mukden. These Chunchuses, who have been taken prisoners, are nominally awaiting trial. In the meantime they are being tortured. The man in the foreground has his arms strung up for hours at a time, partially crucified. The other man has a rope round his temples, which is constantly being tightened. These men were captured by the Russians and handed over to the Chinese judicial authorities.

and they have disowned total abstinence as irrational, ascetic and even unscriptural.

FORMER TEMPERANCE MOVEMENTS.

"To have urged the importance of temperance reform in England twenty years ago would have been, in many quarters, to provoke a smile, and, oftener than a smile, a sneer. But English ecclesiastics, Englishmen of rank, English statesmen and men of the learned professions have been aroused at length to a more intelligent appreciation of the situation.

"By means of coffee houses and cabmen's shelters and reading rooms and club rooms they have made a bid for the patronage of those men and women of the laboring classes who first built the gin palaces of England by their wages and then supported them by their vices.

"And it is no exaggeration to say that nothing which has occurred during the century has done more to restore to the church of England the sympathy of the common people and the friendship and respect of the multitudes who are not of her fold than the organization and work of the Church of England Temperance Society.

"Founded in no narrow spirit of intolerant proscription, it has welcomed men to its fellowship whether they were total abstainers or non-abstainers. It has been content to point men to the admitted evils of national intemperance, and then to associate them in practical measures for their diminution.

"It has not assumed to say that those measures could only be of one kind, nor that intemperance could be dealt with in only one way. It has seen that reform is a principle which may have many illustrations and may employ most dissimilar agencies. And today the future of England and of English homes is just so much brighter because wise and large-hearted men have joined together in behalf of the work of temperance reform.

"When we come to deal with those among whom intemperance most widely and largely obtains we can do something to protect them from the harpies who prey upon their labor, and whose unlicensed gains are a curse and a dishonor to the community that permits them.

"If any of us claim to be the friends of moderation let us see whether something cannot be done to restrain a traffic whose utterly immoderate and unchastened aggressions threaten the very foundation of the State and the peace and order of society itself.

"There is a drink evil, and you and I must not ignore it. There is a task for Christian men and women to perform, and you and I must not shirk it. But let us begin by trying to recognize the facts, and then let us deal with them in a way worthy of their portentous significance.

"The saloon or gin palace, whether it exists here or in Liverpool or Manchester, has for its most determined enemies those who never use it, and, as a rule, know nothing about it. I doubt whether their assaults upon it and their pictures of what its influence has been and is have ever had the slightest effect upon those whom they desired to reach.

CLAIM CERTAIN FEATURES OF THE SALOON ARE NOT EVIL.

"It is in vain that you tell the workingman that the saloon is evil until at least

you are honest enough to recognize that there are features of it that are not evil, and that as often as otherwise those are they which he most of all prizes and oftenest turns to.

"Again, it is in vain that philanthropy —or at any rate philanthropy as feeble, as intermittent and as unintelligent as is much of that which has, thus far, grappled with the drink problem—attempts such measures of reform as simply emphasize the evils which they seek to fight.

"Two or three facts must be plainly recognized and candidly dealt with before we can even make a beginning. For example, one kind of a man goes to a saloon to get an intoxicant, and for no other reason. Another goes there for any one of half a dozen purposes—refreshment, amusement, information, physical easement, business appointment or mere change—for which last you, my brother, go next door to the club, and which all sensible people regard as wholly innocent.

"Now, then, the strength of the saloonkeeper has been in keeping these different wants together. The wisdom of antagonizing him will be in separating them. This the great public house movement in England has done.

"Suppose for a moment that the same genius that has touched and transformed great industries should bend itself, for a little, to understand that great temperance movement which today is going on on the other side of the Atlantic, and to bring to its inauguration among us the best brain and the most generous use of capital in the land—would such a movement be without material as well as moral reward?

"We have come to recognize a great degradation in our mechanisms of refreshment in America. Our next step, should it not be to remedy these things?"

SOME CRITICISMS ON THE BISHOP'S PLAN.

The Rev. John Hall says: "Bishop Potter, in opening his saloon with the doxology, has shocked the moral sense of the republic. As long as men will murder why not teach them how to do it scientifically. The Bishop has fallen beneath a temptation that has blinded his eyes to the moral obliquity of wreathing the fangs of a rattlesnake with roses."

The Rev. Mr. Hopkins said:

"The plea that because the upper classes indulge an evil appetite the lower classes are entitled to the same enjoyment is a logical absurdity. The lower classes represent the large capacity in public sentiment. Instead of imitating they can and ought to reach the upper classes and correct their errors. The Bishop knows that Jesus began with fishermen and by them converted kings.

"As long as villainy in disguise is more dangerous than shameless vice, so long no one but a fool will argue that if a man is going to drink anyhow, he had better use pure liquor instead of cheap liquor. If Bishop Potter knows 'Cobweb Hall' on Duane street he can find there the men who ten years ago started at the marble bar in the Fifth avenue hotel.

"To argue that the saloon is here and we must make the best of it is a wonderful example of cowardice. It is equal to saying that the devil is mightier than God."

THE MALTHUSIAN THEORY.

Java, in violation of almost every law of social and political economy, is becoming so populous that the natives are concerned lest the time may soon come when there will be so many people on the island that food can not be raised for all the mouths that need to be fed. But it seems to be a useless fear, for even at the present time, in an island that is but slightly smaller in area than the state of New York, there is crowded a population of more than 32,000,000 of people. If France had the same density of population its inhabitants would number 120,000,000; the United States at the same ratio would have a population of 1,688,000,000, which is about 100,000,000 more than the estimated population of the world.

Yet in spite of the dreary theories of Malthus and his school, the people of Java seem to thrive and flourish in an amazing manner. Not only is everybody happy, but there is no such thing as poverty on the island. Or, to be more precise, among the natives there is an equality of poverty that places every one upon an equal plane, and yet lifts every one above actual need. Every man, woman and child of the glorious island of the East has enough to live on; every one has a decent place to sleep and an abundance of clothing of the native type, and, though everybody works for a living, they do not work nearly so hard or such long hours as do the people of New York, or, in fact, any American city.

Another point that seems to set the pet theories of the political economists at naught is the fact that in spite of the crowded condition of population, which has a density of 568 persons to the square mile, the Javanese are increasing at the rate of 3,000,000 every five years. This increase, which started twenty years ago, has been constant. In 1890 the population, according to the census taken at that time, numbered 24,000,000. In 1895 it numbered 27,000,000 and in 1900 it numbered 30,000,000. Recent estimates made by the Dutch officials give the population as 32,000,000.

Malthus and his school regarded wars and famines as blessings to thin out overcrowded populations, but in Java there is none of these. A peaceful agricultural people, very religious and extremely careful of the decencies, there is scarcely a chance that civil war will break out among them. They are a homogeneous people, too, and the millions that live on the island look up to the native regent, who rules them under the direction of the diplomatic Dutch resident, and obey the dictates of the throne as if they were divine laws.

As for famine, there is little likelihood that such a calamity will ever visit the island. The land is so fertile and the climate so favorable that it can be made to yield several crops a year. Rice, which is the staple article of diet, is easily and cheaply secured from the neighboring island of Sumatra when the native harvests are short. If Sumatra should fail to have enough to go round, then Borneo or even the mainland can be drawn on. Besides this, all kinds of fruits and vegetables grow luxuriously, so that if one crop should fail there is a plenty of some-

thing else to take its place. So, notwithstanding the theories of the economists, the Javanese are prospering under the most unfavorable (theoretically) conditions. If they wanted to be in accord with what the scientists of Europe have taught for these many years, more than half of them would starve to death at once, or die of the plague, or be killed by wars. But they do nothing of the kind. They are happy and reasonably prosperous. They not only raise enough for themselves, but also enough to enable them to export millions of dollars worth of the products of their fields and forests to this country and to Europe.

THE WORLD'S DREAD IS HUNGER.

The tragedy of human history is that even in the midst of a marvelous civilization the ghost of hunger flits along almost every street. The electric lights have not frightened it away. The noise of the machinery has not driven it into the forests.

The man who has nothing but his daily wages—who has no home, no money in any bank, no property, no pension and no salary—is walking lockstep with hunger.

Hunger is so close behind him that he moves his heels with the nervous jerk of the convict. If he loses his job he feels the clutch of the bony hand.

This is not fancy. It is the daily life of thousands. In the richest city of the world they are living from hand to mouth—they are living as though there were no city—as though they were the Indians who lived on Manhattan Island before the voyage of Columbus.

How shall we get rid of this ghost of hunger? This is the greatest of all questions until it is settled. Everything else is out of order until we have accomplished this.

It is all well enough to build libraries; it is all well enough to plant parks; it is all well enough to endow universities. But the great problem of the United States and of every other country is this: How shall all our people be delivered from the fear of this ghost—hunger.

GERMAN OLD AGE INSURANCE.

The impression prevails that our own pension system, created and administered for the benefit of soldiers and sailors, which carries nearly a million names on the rolls and entails an annual expenditure of about $140,000,000, is the greatest government undertaking of the kind, and so it is in so far as the government's share of the cost goes; but the German insurance against sickness, accident, old age and infirmity reaches out to practically all the workers in the empire, and at the present rate of development will make our military pension system appear a simple and easy undertaking.

The present comprehensiveness of the German insurance for workmen is the direct result of the Emperor's own interest and effort. The system is so complicated and vast that German insurance experts have confessed that they do not understand it in all its ramifications. One thing is clear, which is that the ordinary worker in Germany is pretty well protected

against accident, sickness, infirmity and old age, or may be protected if he will make the least effort.

The insurance is effected through a number of approved companies, some public and others private, but all under the supervision of the State. Under the law as it has been recently extended all workers for wages in the trades, commerce, in agriculture and mines, manufacturers, and, in fact, all wage earners, must be insured against sickness. The workman must contribute from 2 to 3 per cent. of his earnings toward this fund, according to his wages, and in the case of an ordinary day laborer the contribution is from 1½ to 2 per cent. of the wage ordinarily paid a laborer in his locality. For every dollar contributed by the worker his employer must contribute to the fund just half as much. The benefit in case of sickness includes free drugs and medical attendance, and a minimum sick pay, from the third day of the incapacity, of one-half the worker's previous wages; or free treatment in a hospital and one-half the sick pay for the worker's family. During the year 1902 sick benefits amounting to $50,124,950 were paid to 4,800,000 workers.

Accident insurance is in another class, and under the law controlling it employers must contribute to accident insurance funds in proportion to the salaries and wages paid by each employer of labor. The law includes all workers who receive not more than $750 a year. In case of accident, where the incapacity extends beyond the thirteen weeks covered by the sick insurance, the injured workman, if he has been injured through no fault of his own, is given an allowance, so long as he is unfit for work, amounting as a maximum to two-thirds of his wages; and under this law 384,566 persons received during 1902 the sum of $26,000,000.

The infirmity or old age law, which is the latest development of the State provision and care for the workers, applies compulsorily to all persons over 16 years of age who work for a salary or wage of $487 a year or under. Those who receive larger compensation, ranging from $487 to $750 a year, may be voluntarily enrolled in the insurance ranks. All infirm persons who are incapable of sustaining themselves by their own labor for at least twenty-six weeks in a year are entitled to the benefits of the law, and all persons over 70, whether infirm or not, come under the provisions of the law. The allowances are reckoned in five classes, according to the previous annual income of the pensioner. The average pension for the infirm and aged is about $30 per annum, and the cost to the worker ranges from 3 to 9 cents a week. During the year 1902 the sum of nearly $30,000,000 was paid to 1,100,000 persons.

The insurance fund for old age and infirmity is provided by regular payments divided equally between workers and employers, to which the State adds the sum of $12 for each allowance paid.

The growth of the system may be seen from the statement that in 1891 the total amount paid in benefits under all classes of insurance was less than $10,000,000, while in 1902 the sum of $105,000,000 was paid to 6,736,000 persons.

Consequence of the Pursuit of Pleasure.

HOW FRANCE AIDS WORKINGMEN.

France has taken the lead in the matter of bringing employers who need help and employes who need positions together. Free employment agencies are provided for by the terms of a new law recently promulgated. And by the same law paying employment agencies are abolished except in the cases of theatrical agencies, operatic agencies, and agencies for circuses and music halls and nurses.

The provisions of the law have been forwarded to the American authorities by Consul-General Robert P. Skinner.

It is provided that free employment agencies created by municipalities, syndicates of workingmen or employers or both, labor exchanges, farmers' exchanges, mutual aid societies, and all other legally constituted associations are subjected to no authorization, but with the exception of those created by municipalities they are required to deposit a declaration at the mayor's office of the commune where they are established. The declaration will be renewed with every transfer of location of the agency.

By another section of the law government agencies are created, the law setting forth that in every commune a register setting forth the offers and demands for work and for situations shall be opened at the mayor's office and placed at the disposition of the public gratuitously. In connection with this register there shall be prepared classified lists of the individual notices which may be added freely to the demands for work. The communes having more than 10,000 inhabitants shall create municipal agencies.

That there shall be no corruption or favoritism in these free employment agencies the lawmakers have declared that every director of a free employment agency who shall have collected a payment of any character, on the occasion of procuring a situation for a laborer or employe, shall be punished.

GREAT COMBINATIONS OF CAPITAL.

THE FOREMOST PROBLEM IN MODERN POLITICAL ECONOMY.

Patented inventions of machinery enabling one man to do the work of many and the private ownership of natural resources in land are held responsible as the beginning of the great monopolies. Fabulous wealth once in the hands of a few protected by the laws of private ownership enables the financiers to perpetuate and increase their holdings into an enormous and indestructible money power.

How far human ability shall be unrestricted in its conquest to get, to have and to keep, is a problem of justice and social welfare that is now a wholly unsettled question in the minds of the people.

Socialists claim that its only logical end is socialism, that is ultimate state ownership of all the natural sources of public utilities. Many believe that it must result in a powerful plutocracy of wealth ruling despotically a powerless mass of poverty-stricken people. Others maintain that, as every other problem of civilization has worked itself out to the

betterment of mankind so must this finally resolve itself into a benevolent and progressive condition.

In 1904, the trusts had a capitalization of above twenty-five billion dollars, estimated to represent one-fourth of the wealth of the United States and about one-twentieth of the wealth of the world.

The total number of existing trusts is given by Congressman Charles E. Littlefield as 793, capitalized for the enormous sum of over fourteen billion dollars. The railroads are not included in this estimate, their capitalization being over twelve billion dollars. As the national wealth is little more than ninety billions, it will be seen that the trusts represent over one-quarter of our national wealth.

The largest of all trusts is the United States Steel Corporation, organized in 1901. This "Steel Trust," as it is generally called, is a combination of ten large corporations, each of which was itself a consolidation of several smaller companies. Its total capitalization is $1,404,000,000. Its net earnings in 1902 were $111,000,000. The number of its employes is over 100,000.

LABOR UNIONS.

STRIKES AND THEIR RESULTS.

Unions of labor formed to protect and advance the interests of their members are of very ancient origin. At first they were probably mere secret associations of skilled workmen who were to know one another by special grips and pass-words. As manufactories increased and large numbers of workmen were gathered together daily, they became closer organized, and, in the strength of union, began to restrict and complete arrangements to command what they regarded as their rights against the similar enforcements of capital.

Human nature being the same in master and man according to means and conditions, labor and capital thus came to present the remarkable paradox of two things necessary to each other, yet friends only by contract, and antagonists in wholly separated interests.

The capitalist having immeasurably greater means with nothing at stake but temporary profits which he can easily regain by increased prices, has little interest in arbitration, while the union having nothing to gain but the question at stake with greater chances of losing through the at least supposed ability of capital to influence the arbitrators, have also little interest in arbitration. The only means having their confidence is that of the strike, which has few elements of reasonable success from the facts that the loss at worst is comparatively small to capital, which can easily be regained by higher prices, and because of the great number desiring to do their work, while the suffering public abominates both. That the present condition of adjusting disagreements between labor and capital is in a state of chaos unworthy of civilization is manifest to all and the injuries received by the public from both strikers and the capitalists are a shame upon our machinery of justice.

WHAT IS THE RIGHT TO LABOR?

By the "right to labor" most men mean the right of any man to work anywhere.

We are ready to assume that the right to labor gets expression in the "scab," and the denial of that right in the trade union. The exact reverse would seem to be the truth. The entire contention of the union is to secure a social status, the power to form and enforce suitable contracts as safeguards of labor, thereby putting the rights of labor beyond the caprice of the employer. This safety of labor depends exclusively on the trade union. If it succeeds, the fitting terms of such contracts will be slowly determined. If it fails all the claims of labor will fail with it. All the rights of labor lie for discussion and determination between the employer and the employe. It is the unsatisfactory character of this relation that is the ground of controversy. The employer so well understands this that his bitterest hostility is directed against the union and any extension of the union that serves to give it more power.

FUNCTION OF THE SCAB.

It is not difficult to conceive of circumstances under which the employment of "scabs" is the denial of the right to labor:

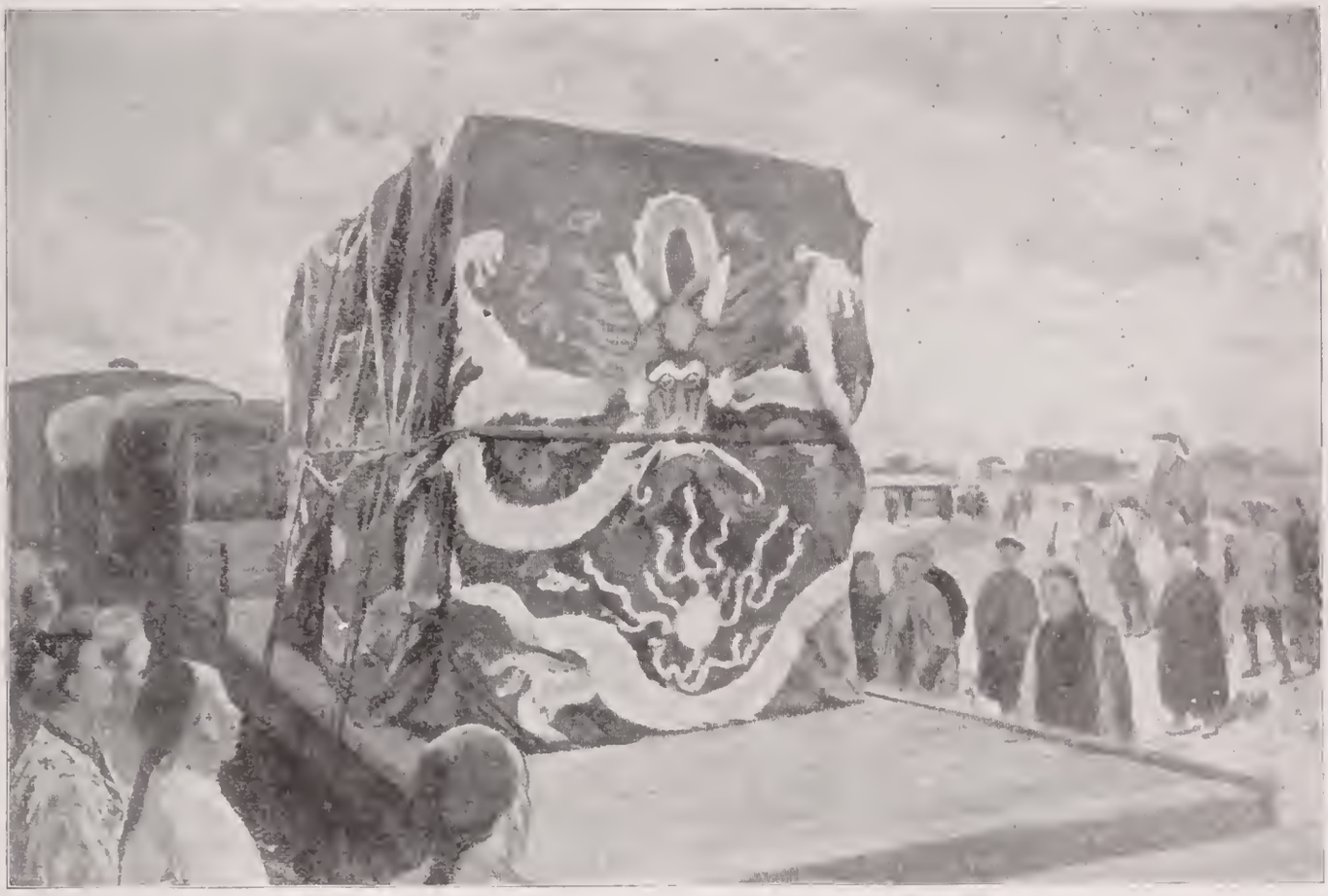
The "scab" is the resource of the employer in breaking down workmen, and in this connection he begins to talk of the right to labor. Yet the scab has no right to labor conceded him by the manager. The scab is taken on and dismissed as suits his own convenience, and this solely that his own power in dealing with the laborer may be unrestrained. The scab makes and enforces no contract. He is present that no contract may be made and enforced. The scab lends himself to the tyranny of the employer, and secures in return only a brief period of employment. When a new equilibrium and a lower equilibrium shall have been established, he, having done what mischief he was able to do, falls back to his old position of waiting for further trouble. Between the scab and the unionist no rights are to be gained. The unionist held his own job, and had not yielded it. The scab steps in to oust him under conditions inimical to the entire class of laborers. The cry of the right to labor made in behalf of the scab is a misleading cry, designed to divert attention from the true issue. His own chances of labor are in no way interfered with. If the scab succeeds, he throws someone else out of labor, and cripples labor in its entire extent.

AN ANALOGY.

A comparison employed by Professor Bascom in his concluding paragraph sheds light on his point of view:

If a contractor, under an agreement to put up a building, should, in the progress of the work, find himself at disagreement with his employer as to the interpretation of certain specifications in the contract, it would not be in order for the latter to say, "There is a man ready to take up and complete the work as I wish it to be done; all you have to do is to stand out of the way." "Not in the least," would be the response. "I have put myself to expense, I have declined other work, and, moreover, I expect to make

something out of the job. The difference in the rendering of the contract must be adjusted, and I must proceed." In the case of the laborer he is first robbed of the power to make a contract, and then robbed of his opportunities because he has no contract. The thing under contention is the power of contract and the rights which go with it. The law and the administration of the law and the action of the "scab" under the law, when they oppose themselves to a fundamental right in a great class, are one and all hostile to democratic society. We can secure no organic completeness in society till every part ministers to every other part in reciprocal advantages. It is on this claim that the rights of labor rest.



The Dowager Empress of China's portrait on its way to the St. Louis Exposition. The portrait of the Dowager Empress of China, painted by the American artist, Miss Carl. It is here shown packed and in transit from Peking to Tongku. It was wrapped in a yellow satin covering bearing strange devices. A special line was constructed to carry it from the Palace to the station in Peking, as the Empress would not allow it to be carried by coolies. The soldiers on guard at the various stations through which the train passed went on their knees and covered their heads.

COMMON LAW ON STRIKES AND COMBINATIONS.

In an article entitled "Employer and Employe Under the Common Law," published in the United States Department of Labor Bulletin No. 1, pages 98 and 99, the common law on the subject of boycotting, as laid down by the courts, is stated as follows: "Every one has the right to work or to refuse to work for whom and on what terms he pleases, or to refuse to

deal with whom he pleases; and a number of persons, if they have no unlawful object in view, have the right to agree that they will not work for or deal with certain persons, or that they will not work under a fixed price or without certain conditions. The right of employes to refuse to work, either singly or in combination, except upon terms and conditions satisfactory to themselves, is balanced by the right of employers to refuse to engage the services of any one for any reason they deem proper. The master may fix the wages, and other conditions not unlawful, upon which he will employ workmen, and has the right to refuse to employ them upon any other terms. In short, both employers and employes are entitled to exercise the fullest liberty in entering into contracts of service, and neither party can hold the other responsible for refusing to enter into such contracts. It has been held, however, that employers in separate, independent establishments have no right to combine for the purpose of preventing workmen who have incurred the hostility of one of them from securing employment upon any terms, and by the method commonly known as black-listing, debarring such workmen from exercising their vocation, such a combination being regarded as a criminal conspiracy. On the other hand, a combination of employes having for its purpose the accomplishment of an illegal object is unlawful; for instance, a conspiracy to extort money from an employer by inducing his workmen to leave him and deterring others from entering his service is illegal; and an association which undertakes to coerce workmen to become members thereof or to dictate to employers as to the methods or terms upon which their business shall be conducted by means of force, threats or intimidation, interfering with their traffic or lawful employment of other persons is, as to such purposes, an illegal combination. Unlawful interference by employes, or former employes, or persons acting in sympathy with them, with the business of a railroad company in the hands of a receiver renders the persons interfering liable to punishment for contempt of court."

HOW FINANCIERS MAKE MONEY OUT OF NOTHING.

ROBBING THE PUBLIC AS A COMMERCIAL PRIVILEGE.

Thomas W. Lawson, the noted capitalist and financier in his exposure of commercial methods in "Frenzied Finance," says that when the change in the plans for the flotation of the Amalgamated were made so that property bought for $39,000,000 was to be unloaded on the public for $75,000,000 he was so deeply involved that withdrawal meant ruin to him and to his friends whom he had induced to go into the deal. Besides, he had been convinced that the properties really were worth the higher figure. At that, when the division of profits was made, he says, he was cheated out of half his share. Continuing, he said:

THE POWER OF DOLLARS.

"At no time in the history of the United States has the power of dollars been as great as now. Freedom and equity are controlled by dollars. The laws

which should preserve and enforce all rights are made and enforced by dollars.

"It is possible today, with dollars, to 'steer' the selection of the candidates of both the great parties for the highest office in our republic, that of President of the United States, so that the people, as a matter of fact, must elect one of the 'steered' candidates.

MAKE CASH OUT OF NOTHING.

"I shall go further and say that there exists today uncontrolled in the hands of a set of men a power to make dollars from nothing. That function of dollar-making which the people believe is vested in their government alone and only exercised under the law for their benefit is actually being secretly exercised on an enormous scale by a few private individuals for their own personal benefit.

"I can better set before my readers this trick of finance by which 'made dollars' are brought into existence by an illustration than by any process of definition. Let us suppose that the United States Government at Washington, the only power legally entitled to issue money for circulation among the people, puts forth a particular $10,000.

INSTANCE IN POINT.

"B, a Western farmer, tills his soil and receives, by the sale of his wheat, the particular $10,000, which he then deposits in the bank. The bank, being a part of the government machinery, only receives, holds and uses the $10,000 under the safe-guards provided for by the laws of the land, so hereafter B's material life is conducted on the basis that he is the full and actual possessor of $10,000. At this stage enters C, the Private Thing.

"C purchases with $3,300 (B's money) which he borrows from the bank a copper mine, depositing the title which he receives from the seller with the bank as collateral for the $3,300. After purchasing, he arbitrarily calls the copper mine worth $10,000—arbitrarily, because his act is not controlled nor regulated by any of the laws of the land—arbitrarily, because the actual cost, $3,300, is his secret and his alone.

SECRET FINANCIAL TRICK.

"Right here is the secret device, the financial trick, by which the greatest power in the land was created, and by which the people can be absolutely plundered of their savings for the benefit of the few.

"At this stage the two-thirds of B's $10,000, of which he later is to be plundered, has not been actually taken away, so he cannot possibly have any evidence yet of the process of plundering him which has been begun, or that the volume of money which he supposes is all that exists has been tremendously expanded. The next step is where C sells his $3,300, stamped '10,000 stock dollars' (which, as already shown, he has exchanged with the bank for the $10,000 deposited by B), to B for $10,000, which $10,000 B withdraws from the bank by simply making out a check in favor of C. (B's inducements to exchange his dollars for the stock dollars of C is the high rate of interest that they will return in the form of dividends, which rate is much larger than the bank can afford to pay.) C deposits B's check with the bank and hereby liquidates his $10,000 indebtedness to the bank.

"At this stage B is still the possessor of $10,000, but it is '10,000 stock dollars.' C is the possessor of $6,700, and D, from whom the copper mine was purchased, is the possessor of $3,300, but the two latter amounts make up the 10,000 real dollars, and The Bank remains where it was at the beginning of the transaction. The people, however, are no wiser, but they know, because they have been most casually educated to such knowledge by C's agents, Wall street, and the press, that their country is tremendously prosperous —that its real prosperity is evidenced by the $6,700 added wealth in the form of 6,700 new stock dollars. At the next stage the financial trick accomplished by the secret device is complete. B, the farmer, who has contracted for new machinery and other necessities and luxuries, to be paid for 'next season' attempts next season to turn his 10,000 stock dollars into real dollars, and C, the Private Thing, knowing their real value to be but $3,300, refuses to make the exchange, but instead, by proclaiming their real value, compels B, who must have real dollars to meet his debts, to sell them for what C, the Private Thing, is willing to pay.

"C, the Private Thing, is willing to pay their worth, which he alone knows is $3,300; he repurchases them at that price from B, that he may repeat the operation at the return of the next 'wave of the country's prosperity.' "

The plan pursued in the flotation of Amalgamated Copper was, Mr. Lawson says, precisely that outlined in the illustration given except that the purchase price was $39,000,000, the price at which it was unloaded was $75,000,000, and the profits $36,000,000, the National City Bank being the intermediary.

INCOME OF THE STANDARD OIL COMPANY IS MORE THAN $45,000,000 A YEAR.

The profits of the present Standard Oil Company are enormous. For five years the dividends have been averaging about $45,000,000 a year, or nearly 50 per cent on its capitalization, a sum which, capitalized at 5 per cent, would give $900,000,000. Of course this is not all that the combination makes in a year. It allows an annual average of 5.77 per cent for deficit, and it carries always an ample reserve fund. When we remember that probably more than one-third of this immense annual revenue goes into the hands of Mr. John D. Rockefeller, that probably 90 per cent of it goes to the few men who make up the "Standard Oil family," and that it must every year be invested, the Standard Oil Company becomes a much more serious public matter than it was in 1872, when it stamped itself as willing to enter into a conspiracy to raid the oil business—as a much more serious concern than in the years when it openly made warfare of business and drove from the oil industry by any means it could invent all who had the hardihood to enter it. For consider what must be done with the greater part of this $45,000,000. It must be invested. The oil business does not demand it. There is plenty of reserve for all of its ventures. It must go into other industries. * * * The result is that the Standard Oil Company is probably in the strongest financial position of any aggregation in the world. And every year its position grows

stronger, for every year there is pouring in another $45,000,000 to be used in wiping up the property most essential to preserving and broadening its power.

STORY OF THE ROTHSCHILDS.—THEIR MARVELLOUS RISE TO VAST WEALTH AND POWER.

In the century and a half that they have been doing business they have amassed a fortune which is incalculable. Estimates of it that have been printed from time to time vary from $100,000,000 to $1,000,000,000. One may obtain some idea of the magnitude of their fortune, however, by comparing the sums which they have lent to various governments.

LOANED BY THE ROTHSCHILDS.

Since 1815 they have raised for Great Britain alone more than $1,000,000,000. They have lent to Austria in the same length of time $250,000,000; Prussia, $200,000,000; France, $400,000,000; Italy, $300,000,000; Russia, $125,000,000; Brazil, $70,000,000, and they have taken up more than $50,000,000 of United States bonds. In addition to such tremendous operations, the Rothschild firms in the cities of London, Paris and Vienna handle a vast amount of private capital. They lend great sums to "embarrassed nobles," and not a few rulers owe the splendor of their courts to borrowed Rothschild gold. For this reason, it is not remarkable that ten of the family are barons.

When Mayer Anselm Rothschild was born in the Judenstrasse, Frankfort, in 1743, his parents consecrated him to the church. Although he worked in his father's store, driving a bargain whenever there was an opportunity, he was told constantly that he was to become a rabbi.

WANTED TO BECOME FINANCIER.

For a long time the boy's remonstrances were in vain, but he finally overcame his father's will in the following way:

The elder Rothschild had left his son one day at the home of a neighboring rabbi, in order that this reverend doctor might persuade the youth to choose the synagogue rather than the counting room. After a long talk the rabbi gave the boy the talmud and asked him to read certain passages. An hour or so later the father came for the child and, finding no one at the door, he stepped into the hallway. A low murmur from an adjoining room caused him to look quickly, and his heart swelled with joy. He saw his beloved Mayer crouching over a book, and chanting from its pages, as if learning something by heart. Approaching nearer he saw that the volume was the talmud.

GRANTS SON'S REQUEST.

"What are you reading, my boy?" asked the father, taking the book with one hand, while he patted his son's head lovingly with the other. Before the lad could answer a loose leaf slipped out and floated to the floor. The father picked up the runaway sheet of paper and stared at it hard. Finally the smile returned, but it was broader and more worldly. The boy had tucked into his talmud a leaf from an old arithmetic. There was no further effort to thwart the lad's ambition, and a year or so later he was sent to Hanover to serve as an employe of the

banking house of Oppenheim. After a short apprenticeship young Rothschild returned to his native town and opened a banking establishment of his own.

START OF BANKING HOUSES.

When Mayer Anselm Rothschild lay dying in 1812 he summoned his five sons to his bed and enjoined them to be faithful to the laws of Moses, to remain united to the end and to undertake nothing without first having consulted their mother. "Observe these rules" was his last injunction, "and you will soon be rich among the richest, and the world will belong to you." The fortune which Mayer Anselm divided among his sons was by no means small. He had been the court banker of the landgrave of Hesse, who was afterward the elector of Hesse Cassel. In 1806, when the elector was compelled to fly before the French he left his large private fortune in the hands of his banker, who invested it so shrewdly that it increased twofold before the elector returned.

ASSIST ONE ANOTHER.

In the belief that they could amass greater wealth by establishing banks in different cities, the five brothers separated. Anselm remained in Frankfort, while Saloman settled in Vienna, Nathan in London, Carl in Naples and James in Paris. But, although the brothers were divided by distance, they were linked together by family and financial ties as inseparably as ever. Whenever possible each assisted the other and in order to prevent death letting any money leak out of the family the members of the family intermarried. The marriage of close relatives has been a custom among Hebrews ever since the days of Isaac, but it has seldom been observed so strictly as by this family. For example, James, founder of the Paris house, wedded his brother's daughter; Anselm, who succeeded his father in the management of the Frankfort firm, took for a wife the eldest daughter of Nathan, and Alphonse, the grandson of the original Rothschild, the present head of the Paris group of Rothschilds, and also by his seniority head of the whole Rothschild family, married his cousin, the oldest daughter of Lionel, son of Nathan.

SOME MARRY NOBILITY.

In a few instances, however, Rothschilds have married outside the family, and have even wed Christians. Hannah, the daughter of Mayer, on March 20, 1878, married the Earl of Rosebery and became the first avowed Jewess to wear the coronet. On December 8 of the same year Margerite Alexandrina, daughter of Charles of the Frankfort house, married the Duc de Gramont. Four years later Bertha, a younger sister of Marguerite, married Prince Alexander of Wagram. Hannah remained true to the religion of her forefathers, but Marguerite and Bertha became Christians.

There are now twenty branches of the Rothschild family and the London, Paris and Vienna houses are all managed by descendants of Mayer Anselm. Lord Nathaniel de Rothschild and Barons Alfred and Leopold are associated in the London house. Barons Alphonse, Gustave, Edward, Adolph and James are the chief members of the Paris firm and Baron Nathaniel Mayer is the family's leading representative in Vienna. The

The Royal Mausoleum of Queen Victoria and Prince Albert at Frogmore.

Frankfort and Naples houses have ceased active operations.

TRAITS OF THE FAMILY.

Among the peculiar traits of the Rothschilds there is none more potent than their superstition. When Baron Alphonse de Rothschild married, he chose for a residence the hotel in the Rue St. George which had formerly been the property of M. Pescatore. The house bore the number 13, and as soon as the baron saw the ominous figures he ordered them torn off, nor did he take his bride across the threshold until the hated numerals were out of sight. But letters still came addressed to No. 13, and the baron became harried by a new fear that legally the number of the house was still the same. Accordingly he applied to the council of the city of Paris for permission to change the number, offering $15,000 to the poor of the district if his petition should be granted. The council accepted the proposition and that is why the baron's house in this street is to-day marked by "No. 11 bis."

FEAR THE SOCIALISTS.

The riotous acts of the old commune still inspire such fear in the Rothschilds who live in Paris that several of them still guard their treasures. The costly paintings, statuary and vases which adorn the home of Baron Alphonse are so mounted that after being exhibited to friends they may be swung back into the wall, at the touch of a spring, and there locked up in steel safes.

Baron Alphonse has been so frequently threatened with death that he never appears in public nor at the track, where he has a string of horses, without a guard of secret detectives. In 1885 he received an explosive letter, which had been loaded sufficiently to blow him up had he opened it.

AN INDICTMENT OF CIVILIZATION.

CLASS ORATION FROM DR. HERRON—NO ESCAPE FROM SOCIAL GUILT.

Civilization denies to man that highest right under the sun—the right to live a guiltless life. * * * If I put sugar in my coffee, I support a trust that practically administers the finances of the United States for personal profit. * * * I can no longer clothe myself, whether in good clothes or cheap, without the likelihood that my clothes are made under sweatshop conditions, in which men and women and children toil together in hot-air slave-pens, fourteen to eighteen hours a day, for earnings that range from two to five dollars a week. If I send my students to pursue further study upon subjects to which I have introduced them, I must send them to receive the benefits of endowments from the hands of a besotted philanthropy, drunken and sated with the wine of life pressed from the crushed and exhausted millions who feed the modern industrial winepress. Whatever I do, whichever way I turn, I can neither feed nor clothe my family, nor take part in public affairs as a citizen, nor speak the truth as I conceive it, without being stained with the blood of my brothers and sisters, without putting my hands into the wickedness that prostitutes every sacred

national and religious function. * * * Society denies me a guiltless "keep." * * * It is just this right to do right which the economic system denies.

"CHRISTIAN BUSINESS LIFE" IMPOSSIBLE.

It is only the densest ethical ignorance that talks about a "Christian business" life, for business is now intrinsically evil, whatever good may come out of it. There is no such thing as an ethical bargain, for bargains are matters of force, fraud, and chance. There are no honest goods to buy or to sell: adulterated foods, shoddy manufacture of all that we wear, the underpaid labor and consumed life that make every garment a texture of falsehood, the hideous competitive war that slays its millions where swords and cannons slay their tens, all unite to baffle and mock the efforts of the awakened conscience at every turn, and make the industrial system seem like the triumph of hell and madness on the earth.

THE DILEMMA FOR THE CONSCIENCE.

Upon the conscience which enthrones Christ, civilization forces this dilemma: seek extrication and peace for yourself, at the risk of losing your soul through the supreme selfishness of living to save it; or else remain in the thick of the wrong, enduring the ethical strain, the tragedy of soul, the moral suffering unspeakable, in order that you may help to bear the wrong away from the necks and souls of your brothers.

The latter alternative is the only one the Professor will allow. "Except the system of things be born again, the individual cannot be socially saved."

NO "PRIVATE PROPERTY IN RIGHTEOUSNESS."

There is no way for an individual to practice his social ideal, if he has one, until it is realized by society; he can only exhaust the possibilities of his life in bringing about the realization; he can plant his life in the common life and die, that he may not abide by himself alone, but may bring forth the fruit of a redemption which shall be to all the people. * * * An individual cannot practice the public ownership of utilities.

THE TRUE PLAN OF SOCIAL SALVATION.

Jesus used the Jewish synagogues, traveled the Roman roads, paid tribute to Caesar, and straitened Himself by the common straits; meanwhile, He put a life and an idea into the world that blew the throne of the Caesars to the skies, and that will level all our plutocracies to the ground; a life and an idea that will yet break every bond, and free every man from the rule of man. But He did it by staying with the people, by being beaten with their stripes, by being ground up in the "machine." If we would follow Jesus in the social redemption, it will not be by escaping Caesar and his tribute; nor by fleeing from competition, wages and monopoly; but it will be by the faithful service of outpoured lives that will yet count strong enough to storm the citadel of monopoly, take its weapons and engines, and thus end the economic war that wastes our work and fields and homes. The vast majority of human beings must live their lives in the machinery of civilization; we can only save the people from being ground to profit by captur-

ing the "machine." And no such responsibility has ever been laid upon individual men as that which is laid upon them by the crisis of social change; no such ethical strain ever came to the human conscience. This is the first time in history that such a task has been seriously undertaken. It is the approaching climax in the world-drama, and the spirit of private ownership is the villain in the drama.

GRINDERS OF THE POOR—VIEWS OF HON. THOMAS WATSON.

The student of history must be profoundly impressed with the fact that so much of the legislation of bygone ages has had for its object the oppression and pillage of the workmen. Philosophers amuse themselves in studies of the old caste system of Hindostan, a system of which the Brahmin was the legalized aristocrat and the Sudra the legalized serf; a system in which this common man, called the Sudra, committed a crime if he sat down by the side of the Brahmin, the legalized aristocrat. If this common man ventured to speak disrespectfully of this aristocrat, his mouth was burned. If he insulted the aristocrat, his tongue was slit; if he struck the aristocrat, the penalty was death. If, yearning to learn something, he listened to the reading of the sacred books, hot oil was poured into his ears; if he committed any of the contents of these books to memory, the punishment was death. Marriage between the upper and the lower classes was prohibited under the most awful penalties, and the law of the empire declared in plain terms that a laborer should not acquire wealth, and that his very name, "Laborer," should be held as an expression of contempt.

In this way, those who had the good things of life sought to keep them forever, and they kept them until their own corruption was the ruin of their magnificent empire.

Let students earnestly investigate certain modern systems of business and government, and they will find many an evidence that in our modern states the laws have been so arranged as to do covertly what was done more openly in the ancient system. The great secret of the legislation of today is, that those who have by unfair means acquired more than their share of the wealth, the privilege and the power, are attempting by every legislative device to hold what they have got, and to add to it.

They tell us that the condition of labor is now vastly improved. That is true; many a workman now enjoys in his cottage conveniences of life which a king could not command some hundreds of years ago. It would be a strange thing, indeed, if civilization could entirely separate itself from those upon whose shoulders it is supported; but the man who can deny that the working people of this country are now suffering from unjust conditions is a very bold man.

The laborer has the right to complain that too much of the weight of taxation falls upon him, the poorer man, when the greater weight of the burden should be borne by the richer man, who is more able to bear it and enjoys to a greater extent the benefits of government.

Jefferson's dream was a system under which the poor should be exempt from taxation and the rich should bear it all.

For this purpose, he favored not only a tariff tax upon the luxuries of life, but also a graduated income tax which should grow heavier as the income grew larger, and thus make the accumulations of dangerous fortunes almost impossible.

Labor has just cause to complain that the hours of work are too long. Men and women should not be made mere beasts of burden; there should be times for rest, recreation, mental improvement. The man who takes his rest on the Sabbath day will do more work and better work during the year than the man who works every day in the year.

The laborer has just cause of complaint because children who are too young for the confinement and the toil are kept at work in unhealthy and exhausting employment. Child labor should be abolished. The very beasts of the field will fight to the death to protect their young at that early period when the parental instinct which comes from God Almighty is supreme. In grinding up our own children in the mines and the mills in order that dividends shall increase the fortunes of those who already have quite as much as they legitimately need, we are doing a most unnatural thing. Christian civilization, like pagan Saturn, is devouring its own offspring.

PRINCIPLES OF THE SOCIALISTS.

The Social Democratic party of the United States, in convention assembled, reaffirms its allegiance to the revolutionary principles of International Socialism and declares the supreme political issue in America today to be the contest between the working class and the capitalist class for the possession of the powers of government. The party affirms its steadfast purpose to use those powers, once achieved, to destroy wage slavery, abolish the institution of private property in the means of production, and establish the co-operative Commonwealth. In the United States, as in all other civilized countries, the natural order of economic development has separated society into two antagonistic classes—the capitalists, a comparatively small class, the possessors of all the modern means of production and distribution (land, mines, machinery and means of transportation and communication), and the large and ever increasing class of wage workers, possessing no means of production. This economic supremacy has secured to the dominant class the full control of the government, the pulpit, the schools, and the public press; it has thus made the capitalist class the arbiter of the fate of the workers, whom it is reducing to a condition of dependence, economically exploited and oppressed, intellectually and physically crippled and degraded, and their political equality rendered a bitter mockery. The contest between these two classes grows ever sharper. Hand in hand with the growth of monopolies goes the annihilation of small industries and of the middle class depending upon them; ever larger grows the multitude of destitute wage workers and of the unemployed, and ever fiercer the struggle between the class of the exploiter and the exploited, the capitalists and the wage workers. The evil effects of capitalist production are intensified by the recurring industrial crises which render the existence of the greater part of the population still more precarious and uncertain. These facts amply

prove that the modern means of production have outgrown the existing social order based on production for profit. Human energy and natural resources are wasted for individual gain. Ignorance is fostered that wage slavery may be perpetuated. Science and invention are perverted to the exploitation of men, women and children. The lives and liberties of

Scene of the assassination of the Russian Minister Von Pleve. A striking snapshot, showing portions of the remains of the carriage in the roadway, taken just after the terrible event. The coachman's hat and parts of the minister's clothing are to be seen scattered about the ground. The conveyance with literally blown to atoms.

the working class are recklessly sacrificed for profit. Wars are fomented between nations; indiscriminate slaughter is encouraged; the destruction of whole races is sanctioned, in order that the capitalist class may extend its commercial dominion abroad and enhance its supremacy at home. The introduction of a new and higher order of society is the historic mission of the working class. All other classes, despite their apparent or actual conflicts, are interested in upholding the system of private ownership in the means of production. The Democratic, Republican, and all other parties which do not stand for the complete overthrow of the capitalist system of production are alike the tools of the capitalist class. Their policies are injurious to the interest of the working class, which can be served only by the abolition of the profit system. The workers can most effectively act as a class in their struggle against the collective power of the capitalist class only by constituting themselves into a political party, distinct and opposed to all parties formed by the propertied classes. We, therefore, call upon the wage workers of the United States without distinction of color, race, sex, or creed, and upon all citizens in sympathy with the historic mission of the

working class, to organize under the banner of the Social Democratic party, as a party truly representing the interests of the toiling masses and uncompromisingly waging war upon the exploiting class, until the system of wage slavery shall be abolished and the coöperative Commonwealth shall be set up. Pending the accomplishment of this our ultimate purpose, we pledge every effort of the Social Democratic party for the immediate improvement of the condition of labor and for the securing of its progressive demands. As steps in that direction, we make the following demands: First—Revision of our Federal Constitution, in order to remove the obstacles to complete control of government by the people, irrespective of sex. Second—The public ownership of all industries controlled by monopolies, trusts and combines. Third—The public ownership of all railroads, telegraphs and telephones; all means of transportation; all waterworks, gas and electric plants, and other public utilities. Fourth—The public ownership of all gold, silver, copper, lead, iron, coal and other mines, and all oil and gas wells. Fifth—The reduction of the hours of labor in proportion to the increasing facilities of production. Sixth—The inauguration of a system of public works and improvements for the employment of the unemployed, the public credit to be utilized for that purpose. Seventh—Useful inventions to be free, the inventors to be remunerated by the public. Eighth—Labor legislation to be National, instead of local, and international when possible. Ninth—National insurance of working people against accidents, lack of employment, and want in old age. Tenth—Equal civil and political rights for men and women and the abolition of all laws discriminating against women. Eleventh—The adoption of the initiative and referendum, proportional representation, and the right of recall of representatives by the voters. Twelfth—Abolition of war and the introduction of international arbitration.

PRINCIPLES OF POLITICAL CHRISTIAN PARTY.

We believe the time to have arrived when the eternal principles of justice, mercy and love as exemplified in the life and teachings of Jesus Christ should be embodied in the Constitution of our Nation and applied in concrete form to every function of our government. We deprecate certain immoral laws which have grown out of the failure of our Nation to recognize these principles, notably such as require the desecration of the Christian Sabbath, authorize unscriptural marriage and divorce, license the manufacture and sale of intoxicating liquors as a beverage, and permit the sale of cigarettes or tobacco in any form to minors. As an expression of consent or allegiance on the part of the governed, in harmony with the above statements, we declare for the adoption and use of the system of direct legislation known as the "initiative and referendum," together with "proportionate representation" and the "imperative mandate." We hold that all men and women are created free and with equal rights, and declare for the establishment of such political, industrial and social conditions as shall guarantee to every person civic equality, the full fruits of his or her honest toil, and opportunity for the

righteous enjoyment of the same; and we especially condemn mob violence and outrages against any individual or class of individuals in our country. We declare against war and for the arbitration of all national and international disputes. We hold that the legalized liquor traffic is the crowning infamy of civilization, and we declare for the immediate abolition of the manufacture and sale of intoxicating liquors as a beverage. We are gratified to note the widespread agitation of the cigarette question, and declare ourselves in favor of the enactment of laws prohibiting the sale of cigarettes or tobacco in any form to minors. We declare for the daily reading of the Bible in the public schools and institutions of learning under control of the state. We declare for the government ownership of public utilities. We declare for the election of the President and Vice-President and United States Senators by the direct vote of the people. We declare for such amendment of the United States Constitution as shall be necessary to give the principles herein set forth an undeniable legal basis in the fundamental law of our land. We invite into the United Christian party every honest man and woman who believes in Christ and His golden rule and standard of righteousness.

SPECIAL NOTABLE FACTS.

PENSIONS.

The United States government has at the present time a list of nearly one million persons to whom it pays annual pensions. This army of pensioners includes survivors of all the wars, excepting, of course, the war of the Revolution, soldiers and sailors who are in receipt of service pensions granted for service rendered prior to 1858, together with the widows of soldiers and sailors, for whom provision is made under certain conditions. The exact number is 996,545, of which number 4,709 reside outside of the United States. The total expenditure in pensions during the fiscal year was $137,759,653. Since the pension system was established it has cost the government a total of $3,037,826,081, an amount which is exclusive of the cost of establishing Soldiers' Homes. The Bureau employs a force of 1,734, which with the employes of the agencies, 431 in number, makes a total of 2,167. The total cost of administration during the year 1902-1903 was $3,993,216. More than one-half of the pensions paid are $100 per year or less, and the average value of all pensions allowed is $133.49. The number of applications for pensions examined during the year 1903 was 226,002.

COST OF A NATIONAL CAMPAIGN.

While it is said to have cost only $200,000 to elect Abraham Lincoln in 1864, four times that sum was spent in the Hayes-Tilden campaign of 1876, while in 1888, with tariff as the issue, $2,000,000 was said to have been used by both sides, and the figures have mounted upward since in some of the later campaigns, till it has been claimed that the entire expenses of both parties have together exceeded $10,000,000. The cost of maintaining national headquarters, with its army of employes ranging from forty to 100 men and women, has been estimated to be about $3,000 a day. There

are stump speakers who receive $100 a week and expenses. The distribution of a single speech in printed form has cost as much as $5,000, and there have been campaigns where twenty of such speeches have been delivered and circulated. New York and other cities had torchlight processions costing as much as $12,000, while $3,000 more has been expended on a single mass-meeting for the music, decorations, and hire of the hall. But these are only the minor items of disbursements. The heavy ones are made out of what is known as a secret or emergency fund. Both sides are continually drawing from it, and usually exhaust it on the eve of election. The fund is used to turn the tide in states that are considered doubtful, especially those on which the general result hinges.

FLAG OF THE UNITED STATES.

The official flag of the United States bears forty-five stars in a blue field, arranged in six rows—the first, third, and fifth rows having eight stars each, and the others seven stars each. The garrison flag of the Army is made of bunting, thirty-six feet fly and twenty feet hoist; thirteen stripes, and in the upper quarter, next the staff, is the field or "union" of stars, equal to the number of States, on blue field, over one-third length of the flag, extending to the lower edge of the fourth red stripe from the top. The storm flag is twenty feet by ten feet, and the recruiting flag nine feet nine inches by four feet four inches. The "American Jack" is the "union" or blue field of the flag. The Revenue Marine Service flag, authorized by act of Congress, March 2, 1799, was originally prescribed to "consist of sixteen perpendicular stripes, alternate red and white, the union of the ensign bearing the arms of the United States in dark blue on a white field." The sixteen stripes represented the number of States which had been admitted to the Union at that time, and no change has been made since. Prior to 1871 it bore an eagle in the union of the pennant, which was then substituted by thirteen blue stars in a white field, but the eagle and stars are still retained in the flag. June 14, the anniversary of the adoption of the national flag, is celebrated as Flag Day in the public schools, and by the display of the emblem on public buildings and private houses in a large part of the Union.

THE MONROE DOCTRINE.

The famous "Monroe doctrine" was enunciated by President Monroe in his message to Congress December 2, 1823. Referring to steps taken to arrange the respective rights of Russia, Great Britain and the United States on the northwest coast of this continent, the President went on to say:

"In the discussions to which this interest has given rise, and in the arrangements by which they may terminate, the occasion has been deemed proper for asserting, as a principle in which the rights and interests of the United States are involved, that the American continents, by the free and independent condition which they have assumed and maintain, are henceforth not to be considered as subjects for future colonization by any European power. * * * We owe it, therefore, to candor and to the amicable relations existing between the United States and those powers to declare that we

should consider any attempt on their part to extend their system to any portion of this hemisphere as dangerous to our peace and safety. With the existing colonies or dependencies of any European power we have not interfered and shall not interfere. But with the governments who have declared their independence and maintain it, and whose independence we have, on great consideration and on just principles, acknowledged, we could not view any interposition for the purpose of oppressing them or controlling in any other manner their destiny by any European power in any other light than as the manifestation of an unfriendly disposition toward the United States."

Secretary Olney in his despatch of July 20, 1895, on the Venezuelan Boundary Dispute, said:

"It (the Monroe doctrine) does not establish any general protectorate by the United States over other American States. It does not relieve any American State from its obligations as fixed by international law, nor prevent any European power directly interested from enforcing such obligations or from inflicting merited punishment for the breach of them."

MILLIONS PAID FOR NEW TERRITORY.

The cost of the acquisition of vast territory by the United States is given in the following list: Louisiana, $10,000,000; Florida, $5,000,000; Texas, $18,500,000; California and New Mexico, $15,000,000; Arizona, $10,000,000; Alaska, $7,250,000; Philippine Islands, $20,000,000; Panama canal, $40,000,000; Panama canal strip, $10,000,000; total, $140,750,000. In addition the United States when it annexed Hawaii assumed a debt of $4,000,000.

DIVORCE AND POLYGAMY.

The Law Bulletin in an article by a prominent attorney shows that a defendant in a divorce may at any time within five years apply for a writ of error, and if reversible error is shown by the record the decree is annulled, modified or a new trial granted, according to the law of Illinois.

Should a decree by which a wife is divorced be revised the divorced woman is reinstated as the complainant's wife, the question of whether the man has in the meantime remarried and become the father of a child by the second wife having nothing to do with the case.

"But what relation does the second wife and the child born in lawful wedlock bear to him?" continues the writer. "If the second marriage was valid at the time it was consummated, the second wife cannot be divorced until she has had her day in court, and if the child is once legitimate it is legitimate forever."

ALIEN PAUPERS AND CRIMINALS.

The Commissioner General of Immigration reports that there were in the prisons, insane asylums, and poorhouses of this country during the first four months of the year 44,582 aliens who have been in the United States less than five years. Of these 28,939 are males and 15,643 females. There are 20,279 insane and 14,604 paupers. Of the inmates of prisons 3,995 are confined for grave offenses.

BOOK IV

Prosperity Happiness and Character

WITH THE

THEORIES AND CONCLUSIONS OF THE GREATEST LIVING AUTHORITIES ON THE ACHIEVEMENT OF SUCCESS IN LIFE

SPECIFIC INSTRUCTION IN THE PRECEPTS, FORMULAS AND PRINCIPLES REQUIRED IN THE MODERN CONDITIONS OF SOCIETY

A TALISMAN FOR A JAPANESE SOLDIER.

In Kobe women are seen about the street with long, narrow pieces of cotton stuff, in which they invite other women to put a few stitches. On each piece of cloth are a thousand black dots, and when each dot has had a thread passed through it by a different woman, the stuff is believed to have power to protect the wearer from all dangers in war. Very often quite a little crowd of eager women gathers in the streets round someone who is anxious to obtain the necessary stitches for a husband, a son, or a sweetheart.

CHARACTER, HAPPINESS AND SUCCESS.

THE BASIS UPON WHICH TO BUILD THE VALUES OF LIFE.

"I have lived many years in the world, and have known many great and strong men. It has been my observation that all strong men, the men who do the most for their country and the world, are men of strong religious convictions. My advice to you, as you go out into the struggle of real life, is that you make up your minds that some way is the right way, and then follow that way unflinchingly."—Prof. J. P. Mahaffy of Dublin University to the Students of the University of Chicago.

To give such advice might seem unnecessary. Yet it is not unnecessary, for it counsels the formation of a habit of mind without which real success in life of any kind is impossible, and points out the only effective remedy for the mental disease which most retards social betterment and to which the most highly educated division of mankind seems most subject.

CORRUPTION OF POLITICS.

Many of our most highly educated men continually complain of the corruption of politics, and lament that they are unable to do anything to cure this evil. Why are they unable? Is it not because they themselves—they for whom society and the state have done most—are without strong convictions of civic righteousness? They see the evil. They denounce it. And then they pass on. Their convictions are not strong enough to compel them to descend into the arena and do the hard work—the sweaty and often dirty work as it seems to their refined taste—necessary to put down the evil and establish the good.

Men professing the highest ideals continually complain that the temper of the age is sensual and materialistic, thinking only of getting all the pleasure possible out of life. Grant for the moment that the charge is true. Why is it true? Is it not because many of the very men who make the complaint show and even boast themselves destitute of any positive conviction of the destiny of the human soul when this life is done, and so encourage by their example their less fortunate fellows to regard their day on earth as all there is of life? And if the grave be the end of man's living why should he not eat, drink, and be merry, no matter how, while he can, knowing that the rest is merely silence?

SOCIAL CULTURE.

The disease of culture—the malady that holds it better to know than to do, and that puts refinement of taste above efficiency in work—is what produces the creeping paralysis of mind that sees evil but cannot stop it—that longs for the good but cannot achieve it. The feeling

that life is merely a task to be got through as easily as possible, instead of a training for the greater and more glorious fields of effort to which death is but a gateway —the lack of religious conviction and positive faith—these are the influences that make so many who should be efficient for good helpless to achieve the good they desire.

What the world needs most today is men whose keen intelligence and high ideals are bottomed on the rock of strong convictions and positive faith in the destiny of the human soul as ever onward and upward through the gates of death and through all the boundless realms of eternity. Without that faith those who should be our best guides are but blind leaders of the blind. They cannot guide us over life's sea to the harbor of righteousness, for on that sea they are themselves helplessly adrift, with neither map nor compass.

WHAT IS SUCCESS?

Success consists in being of some small use to the community or country in which one lives. It consists in having an intelligent, sympathetic outlook upon human affairs. That man has made at least a measurable success of his life who loves books, and art, and nature. It is success to love one's work. It is success to have friends and be a friend. To have a home it is a daily perennial delight to return to —this is success. To have ruddy, healthy children who climb upon your knees, and who are a comfort and stay so to you when you are old—this also is success. To have the poise and philosophy to bear with a light heart and a tranquil mind the rebuffs and blows of fortune, should they come—this is success.

HOW TO SUCCEED.

THIS STRIKING ARTICLE SHOWS WHAT MAY BE LEARNED FROM AMERICAN METHODS.

In America there is always an opportunity and a proper recompense for the man—

I. With ideas.

II. With initiative.

III. With the power to accomplish.

Any of these is an invaluable asset; the three in one marks the really successful American business man.

Ideas come from clear thinking and analysis; initiative demands energy; accomplishment, system and perseverance.

It is one of the strong points of the American that he does not wait for inspiration.

Just as he gets results by hard work, he gets ideas by hard work.

In fact, activity is not hard work at all compared with thinking.

Whatever the occupation he is engaged upon, he seeks untiringly for improved methods.

MONEY FOR IDEAS.

And whether he originates them, or they come to him in the form of suggestions from others, he receives them with an open mind, and considers them rapidly, but with exhaustive penetration.

It is because of this fact that Americans surpass any other people in the presentation of ideas. Being sure of a hearing, they have studied the art of effective

suggestion. When they have an idea in the value of which they believe, they are not afraid to spend time and money in putting it in such form that others can have it placed before them to the best advantage. Before attempting to convince others, they first convince themselves.

It follows that Americans are the best salesmen in the world.

When they have a story to tell, it is told in the most forcible manner. It is well weighed, to discover not only the strong points, but the points that will be most open to attack. Thus to every objection the salesman is ready with an argument, and it is impossible to describe the manner by which they make light of criticism, or the ingenuity with which they turn from a disputed point on which they have once gained the advantage.

Naturally observant, they are quick judges of character, and are more concerned in noting a man's strong points, from which they may have to fear resistance, than his weak points. For the temporary advantage they may gain over the latter is likely to be quickly overcome by afterthought.

NO RED TAPE.

While dealing with the subject of ideas, it is worth while to draw your attention to the accessibility of the American business man.

It is not merely from good nature that Americans are so approachable, but because they believe in the value of intercourse. They are always on the lookout for new ideas and new men, whose services will be of value to them.

However busy an American is, if you have a legitimate claim on his time, you can see him without any red tape whatever.

It is impossible for Englishmen to have any proper conception of the far-reaching results of the constant intercourse between strangers in America; not only because of the policy of the open office-door, but as the result of casual acquaintanceship struck up in the hotel lobby, the train, or the steamer.

The Englishman may be in America four or five years, and in that time hardly enlarge his circle of friends at all. But the American is always getting to know new people and coming into closer relationship with those he has previously met. Friends are with him a business asset, and there results a mutual interchange of benefits.

Exclusiveness hardly enters into commerce.

Now, added to the production and interchange of ideas, initiative is another American characteristic.

Present an idea to an Englishman of the old school, and he will overwhelm it with prejudice, or think it over till it dies of mortification—or the originator of it does.

But the American will first weigh it, and, if the impression is favorable, put it not only to a quick, but a thorough, test.

Initiative is the ability to take an idea off paper and put it into practice.

BE THOROUGH.

No one will charge Americans with procrastination; but it is worth remarking that the faculty of starting and putting things through the preliminary stages into actual operation is one to be

held in the highest esteem on account of its rarity.

Beginnings are usually commonplace, and nearly always difficult to direct, on account of the innumerable possibilities of form that present themselves. It might be expected, therefore, that just here we should meet another American characteristic. Following quick decision comes fixity of purpose. Concentration is one of the powers that the American business man possesses to an extraordinary degree. He goes to work with energy and system. The American, if he is anything, is thorough.

That the Americans enjoy difficulties is a conclusion which any careful student of their business methods quickly arrives at.

When there are two ways of doing anything, the American has learned from experience to choose the most difficult. There are no other people in the world so successful in getting things done. They hate defeat, and have no ear for excuses.

Indeed, it may be charged that they err in intolerance of reasons for failure. They don't want to hear them. They assert a disbelief in their existence. "Where there's a will there's a way" is a part of every American's creed.

ART IN TRADING.

The only defeat they are ready to admit is a thorough one. To have convinced an American that he is on the wrong track is to have already started him off on a new one.

The American business man is a student of his trade. His tendency is to convert it into an art—of which the extraordinary development of the advertising business affords an example.

The psychology of advertising has been mastered in America in a way that has never been attempted before. The specialist who commands almost fabulous salaries has long ceased to be an experimentalist. He not only knows how to attract attention and to create business, but he has analyzed the cause that produces the effect.

Writing and preparing advertisements has become a science, on which some of the most able men in the country are engaged.

You must bear in mind, in the study of American methods, that they are based on reason; analysis precedes experiment.

Honesty is a substantial characteristic of American business methods.

And to honesty add enterprise.

FRANKNESS OF MANNER.

There is no more delightful trait in the young or the old than absolute frankness and openness of nature, that transparency of character which lets us see the best and the worst in them, their strong and their weak points, without any effort at concealment.

Everybody admires the open-hearted, the people who have nothing to conceal and who do not try to cover up their faults and weaknesses. They are, as a rule, large-hearted and magnanimous. They inspire love and confidence, and by their very frankness and simplicity invite the same qualities in others.

Secretiveness repels as much as frankness attracts. There is something about the very inclination to conceal or cover up which arouses suspicion and distrust.

We cannot have the same confidence in people who possess this trait, no matter how good they may seem to be, as in frank, sunny natures. Dealing with these secretive people is like traveling on a stage-coach on a dark night. There is always a feeling of uncertainty. We may come out all right, but there is a lurking fear of some pitfall or unknown danger ahead of us. We are uncomfortable because of the uncertainties. They may be all right, and may deal squarely with us, but the trouble is that we are not sure, and cannot trust them. No matter how polite or gracious a secretive person may be, we can never rid ourselves of the feeling that there is a motive behind his graciousness, and that he has an ulterior motive in view. He is always more or less of an enigma, because he goes through life wearing a mask. He endeavors to hide every trait that is not favorable to himself. Never, if he can help it, do we get a glimpse of the real man.

How different the man who comes out in the open, who has no secrets, who reveals his heart to us, and who is frank, broad and liberal! How quickly he wins our confidence! How we all love and trust him! We forgive him for many a slip of weakness, because he is always ready to confess his faults, and to make amends for them. If he has bad qualities, they are always in sight, and we are ready to make allowances for them. His heart is sound and true, his sympathies are broad and active. The very qualities he possesses—frankness and simplicity—are conducive to the growth of the highest manhood and womanhood.

PROSPERITY P'S.

Push—The force by which one's ideals are converted into realities.

Punctuality—A saver of time and temper. A creator of confidence.

Politeness—The golden key that unlocks the door to many an opportunity.

Principle—A self-imposed rule of right conduct which governs every action.

Penetration—The ability to foresee events, and consequently to provide for them.

Poise—The power of self-control, which often makes one master of the situation.

Precision—The habit of being accurate, and thus of averting annoyances arising from error.

Prudence—The practice of acting with discretion, and of wisely husbanding one's resources.

Perception—The happy faculty which enables one intuitively to say and do the right thing at the right time.

Perseverance — The characteristic which impels one steadfastly to pursue the object in view with an invincible determination to triumph over all opposition.

HOW TO MAKE A FORTUNE.

Mr. Russell Sage is rated as "the wealthiest self-made millionaire in the world. With no other capital than his two hands, his head and the position of errand boy in a country grocery shop, this well-known New York man of money has amassed a fortune of over $100,000,000." He is "perhaps the greatest railroad finan-

cier in the world, and controls over forty railroads." He says:

"The secret of money-making is so simple that it can be mastered by any person of ordinary intelligence. It consists of nothing more difficult than the strict observance of a few common-sense rules.

FIVE FOUNDATION RULES.

"There are five fundamental principles which must be laid down by every person starting out with the wish to have a successful career. These are: Honesty, temperance, patience, punctuality and strict adhesion to fixed rules for his office and his home. There are other rules to be followed in different lines of work, but these five must invariably be followed in all cases. These five rules are the foundation rocks upon which every fortune must be erected, or else that fortune will be certain to some day totter to the ground.

"A man may sometimes make a skyrocket fortune by neglecting strict business principles, but like Hooley and many other prominent examples his wealth will some day be suddenly swept away.

THREE OTHER ESSENTIALS.

"To amass a big, permanent fortune in some business enterprise, every man must combine his strict adhesion to business principles with, first, a genuine liking for the work he has mapped out for himself; secondly, a clear, cool brain; and, thirdly, a bull-dog determination that he will overcome all obstacles that crop up from time to time. 'Every business and profession is overcrowded,' is the cry. It is, no doubt, true that there are more men in the field today than there were twenty-five years ago—at least, it is so in America, but, on the other hand, the field itself has been enlarging all the while. There is always lots of room at the top everywhere.

THE BEST EDUCATION FOR A FORTUNE-HUNTER.

"I do not believe, generally speaking, that a college education will hurt any youth, but I do believe that in many cases it is so much trouble, time, and money thrown away. On one hand, if the boy wishes to become a lawyer, or a clergyman, or an author, there is no doubt about it that a college education will help him enormously to achieve success. But, on the other hand, if he intends to enter upon a business career, I do not see how a college education is going to help him any.

"The kind of education that counts most of all is a common school education, supplemented by a habit of reading books of information, the newspapers and the magazines, in the hours of leisure. Put the boy to work when he gets through school, and let him do this reading in the evenings and on holidays."

THE VALUE OF HONESTY.

Mr. Sage says dishonesty may accumulate wealth more rapidly than honesty, but sooner or later the secret must leak out, and then "the man's happiness is at an end." He will be hated by the poor and despised by the rich.

"The trite old maxim that 'Honesty is the best policy' is as true today as it was the day it was first uttered. Too much pleasure-seeking has, more than any one other cause, brought fortunes tumbling about the ears of their owners. It has

Ancient trial of the Egyptian dead recently rehearsed in Cairo. Forty-two judges were chosen and accusers of the dead brought forward their claims against the righteousness of his life. He was defended by a friend. If a majority of the judges decided adversely the body was denied burial in consecrated ground.

nipped in the bud an enormous number of promising careers."

Mr. Sage mentions a sympathetic and intelligent wife as another valuable auxiliary in the task of fortune building. He concludes:

"Of course, everybody cannot become a millionaire. But it is in the power of every ambitious young man to, in time, increase his starting capital ten thousand fold."

THE TALENT FOR SUCCESS.

Longfellow once said that the talent of success is nothing more than doing what you can do well, without thought of fame.

Man was made for action and life is simply a field for brain and heart exercise. We owe a large part of our happiness to our mistakes, and it is true that happiness is never found in failure.

INSPIRATION AND ASPIRATION.

Don't mistake aspiration for inspiration. Ambition without genius is sure to end in failure. A man may be a very successful lawyer, though he might fail if appointed chief justice. A man may be a successful teacher, but entirely unfit for the position of college president. It is a mistake to say that a man can be whatever he wills to be.

WILL AND BRAINS.

The strongest and most constant will in the world is not an entire substitute for brains. All callings are alike honorable if pursued with an honorable spirit. A blacksmith may be a man of polished manners, while a bank president may be a clown. It isn't enough to say that if a young man will only do thus and so he may reach success. The power of patient labor is the very essence of genius. What a man does is the real test of what he is, and to intimate that a certain person would accomplish great things if he had more activity of mind is to say that he would be stronger if he had more strength.

EFFORT AND GENIUS.

All experience shows that it is the nature of genius to labor patiently and hence it is easy to leap to the conclusion that genius is but patient labor. Don't run away with the idea that will can do the work of intellect, or that effort can take the place of genius, or that mere intensity of desire can give intensity of power. Great deeds are done by great men and often without effort. Neither do great occasions make great men. They bring great men to the front, before the public eye, use them, but do not make them. It is more often that great men make great occasions. No man is ever a great man who wants to be one. Shakespeare wrote for money not for fame. Homer sang to kindle patriotism in the hearts of his country men. Grant, apart from his work, was the most ordinary man in a thousand.

NO ONE KNOWS HIS POWERS TILL THE DAY OF TRIAL.

However, no man knows what are his powers, whether he is capable of great things or small, until he has tested himself by actual trial. The more limited your powers the greater need of effort.

There lives not a man on earth who has not in him the power to do good.

Have you ever entered a cottage, ever traveled in a coach, ever talked with a peasant in the field, or loitered with a mechanic at the loom and not found that each of these men had a talent you had not, knew some things you knew not?

The most useless creature that ever yawned at a club or counted the vermin of his rags under the suns of Calabria has no excuse for want of intellect.

PURPOSE IN LIFE THE PROFOUND NEED FOR SUCCESS.

What men want is not talent, it is purpose; in other words, not the power to achieve, but the will to labor. Very ordinary ability, properly made use of, must bring a certain measure of success. Men are pushed forward by events over which they have no control—they never know their own power until it is measured up against enormous obstacles. Success depends more upon ability adapted to work than upon any superior intellectual power.

A moderate talent, well applied, will achieve more useful results and impose more upon mankind than minds of the highest order whose temper is too fine for mechanical or industrial pursuits. Besides there is a discretion more valuable than the most extensive knowledge.

Men must have tact and good judgment and quick perception.

NECESSITY FOR INDUSTRY.

Men of genuine ability are rarely idle. To allow them to remain idle is to allow capital which may pay large profits to remain uninvested. Hold your ground and push hard. Watch opportunities. Be rigidly honest. The young men who spend their evenings smoking cigarettes and telling shady stories with the street corner for their location and packing boxes for chairs, need not spend any time learning "how to write a check," for the chances are a thousand to one that they will never have a bank account.

SPECIAL PRECEPTS FOR THE POWERS OF SUCCESS.

"My mind to me a kingdom is." Some things are out of our control.

Sometimes we want money and instead we have poverty.

We want lovely homes and we have inside flats or boarding house rooms.

We want parties and gayety and we spend our evenings mending hose and making over last season's fashions.

We want leisure and we have work.

We want position and we have the lot of the lowly.

We want pleasure and we have hardships.

We want fame and we have obscurity.

We want grace and ease and charm, and we have timidity, self-consciousness and awkwardness.

We want to be popular and bright and we are stupid and lonely.

MISLEADING IDEAS.

If we only would think it over we might conclude that everything was topsy-turvy, and upside down, and inside out, and "wrong side to," and anything and everything, and all things except right.

We feel like the sport of fate.

The toy of chance.

The prey of destiny.

The helpless victim of unseen and unkind force.

The fool of folly.

A mistake, a failure, a blot.

No, no; the mistake and the failure are in so thinking.

There is a place where each one of us is king and queen, monarch and sovereign, lord over all.

There is a place where we may set fate at defiance and merrily laugh destiny to scorn.

There is a place where one will rules.

Where our wishes turn the tide of events.

Where our desires are law.

Where our determinations are sovereign.

Where our likes know no contradiction.

Where our plans suffer no defeat.

Where our pleasure is supreme.

Where hope is fulfilled.

Where ambition is victory.

POWER OF MIND.

This place is our minds.

The world may be sad. Our minds can be gay.

Business may be upside down and slack. The mind can be forever in shipshape and apple-pie order and teeming with riches.

Our face and figure may be plain; our mind can be beautiful, rarely beautiful.

Our arms and legs may be awkward, our mind can be graceful with sweetness and hopefulness.

Our lot may be lowly from the viewpoint of externals; our mind can be lofty and noble, the peer of the world's greatest ones.

Our home may be a small article on a back street; our mind can be a palace, a "mansion where dwell all sweet sounds and harmonies."

We may darn stockings with our fingers; we can play harps with our minds.

This sovereignty of our minds is a powerful sovereignty.

Rule your mind, conquer your mind, have power and dominion over your mind, and the world lies at your feet, all the world.

Have peace and contentment in your mind and there is peace and contentment in your world.

Store your mind with riches and your world is stored with riches.

Be great, grand, free, strong in your mind, and all your world is great, grand, free, strong; the rabble is below you.

COURAGE, NERVE AND CONFIDENCE.

Is it possible to become a man of nerve? Ask the weary plodders, the people who keep up a treadmill gait of hard, persistent work, but who never strike out for themselves, never assume responsibilities. "We can't," they say; "we don't dare." They want some one else to lead. They cannot advance of their own volition. Doubters, imitators, weaklings, they make but little progress.

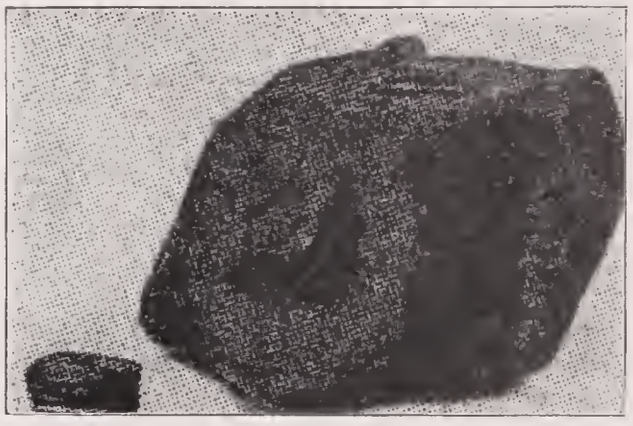
The only way to become a man of nerve is to practice nerve; to exercise your nerve on every possible occasion. Take the point of view of the men of

nerve and hold to it. Timid people never make any progress, because they want to be sure of winning every time. That is why they shrink and shrink. They think they can't stand failure. They look too narrowly at results instead of being anxious only to play the game well. You can't find out whether you can do anything till you do it. And there is a lot of truth in that line of Virgil we translated so atrociously—

"They can because they think they can." But you must risk failure before you can accomplish anything. What a boon it would be to timid people if nerve were only put up in bottles and sold at the corner drug store! The timid people haven't the nerve of a rabbit, and know it; the hosts of timid folk are full of timid ambition, uneasy desires, yet shrink and shrink because they haven't the nerve to stand failure. So they fail more and more ignominiously every day.

It is possible for a timid man to change his attitude toward difficulties; it is possible to stop looking at results merely and to embrace difficulties and dangers with zest. Remember, if you want nerve you must exercise it; and risk is what the man of nerve enjoys; he hates a dead sure thing. Why not try his way of looking at things? The man of nerve likes to stake something on every throw, and the bigger the stake the better he likes it. It is the stake that gives snap and zest to the game, the play element that makes light of difficulties. Try it, and see if the thistle grasped firmly does not lose its power to wound. Try the point of view of the man of nerve and see what it will do for you.

But don't confuse nerve with rashness, recklessness, uncalculating folly. The man of the most magnificent nerve must, if he is a success, consider means and results most carefully. Attempting a thing just because you see somebody else doing it, without understanding anything of the qualities required, or, if you do, without considering how near you come to possessing them, is not the thing to do. That is mere rashness, a poor relation of the magnificent quality we are considering.



BOMB IN A PIECE OF COAL.

Incredible ingenuity is exercised by Russian nihilists in making, carrying and disguising bombs. A chatelaine bag of a beautiful woman may be an infernal contrivance, which, on being hurled, may send death and destruction over a terrible radius. And a humble thing like a piece of coal may also be as deadly as the ordinary spherical bomb. This picture shows one made of a piece of coal and loaded with enough explosive to wreck a building of considerable size. Its smallness makes it handy to carry, and its exterior does not render it an easy object of suspicion.

The man of nerve, having considered means, difficulties and all possible results, makes his decision, and then throws his whole being into the effort to make the enterprise, however difficult and dangerous, a success. To do this you cannot have the thought of failure hovering like a black-winged bat somewhere in the back of your mind. The man of nerve never does have. Having decided on a course of action, he gets all the pleasure

out of it he possibly can, by fixing his mind on shining success—perfect, golden success—and by enjoying the fight with difficulties as an opportunity to show his mettle.

You don't need nerve to be a good follower; lesser qualities will do. But if you want to be a leader, cultivate your nerve. If you aim at eminence in any direction, cultivate your nerve—the quality that enables you to initiate movements, to forge ahead of the crowd. In fact, if you have any ambition at all, cultivate your nerve. Is there something you want to do and don't dare attempt? Wake up, timid folks; have a try at it! You will be dead a long time—probably a long, monotonous time. You might as well try for what you want while you are alive.

POWER OF SELF-CONTROL.

WONDERFUL CONTROL OF THE HINDOOS.

Every one is familiar with the wonderful control which Hindoos exercise over both their minds and their bodies. They can stand or lie still for hours without so much as the movement of a muscle, and gaze one between the eyes with the impassive stare of an Egyptian mummy. That this control of the nerves endows one with much greater mental and magnetic power the Hindoos assert and demonstrate with their jugglery of the natural laws of nature, even to the extent of being buried alive for several days at a time and serenely appearing upon the scenes of life again.

We all know that absolute rest for and command over the nerves is one of the greatest boons that humanity can acquire. What wonder, then, that the overstrained, restless, exhausted society and business women of the large cities have thronged classes where control of the nerves is taught?

The exercises, which form the most important part of the Hindoo lessons in nerve control, are based upon the fundamental truth that all the vital forces in the body centre in the lungs, and that breathing according to certain rules will generate new and healthy forces in the body, which find expression in absence of nervousness, strong personal magnetism, and an ability to concentrate the mind readily upon a given subject.

While every woman may not hear Hindoo philosophy, every woman may practice its exercises and receive their beneficent results.

PROPER EXERCISE WILL GIVE CONTROL.

The first position is taken with the heels together and hands hanging at the sides. The position should be erect, without stiffness, and the mind should dwell upon the philosophy of nerve control while the lungs inhale and exhale deeply. When both mind and body seem concentrated upon the matter, with a long inhalation the arms should be raised slowly at the sides, in a relaxed position, till on a line with the shoulder. This attitude is retained for a few seconds, while several breaths are taken. Then, with lungs full of air, the arms should fall slowly to the sides, with the elbows held in toward the

body and the hand and forearm forming a curve. During this gentle movement the breath should be exhaled so softly that the effort has the effect of being unconscious. One has a drowsy sensation which, in a little while, gives place to

The erect position should be retained in this movement and a finger of the left hand pressed against the right nostril. This exercise is the same as the first, and may be practiced first with the right arm and the right nostril closed, and then with

BASKET-MAKER OF JAMAICA, WEST INDIES.

This man during the summer makes these baskets from palm leaves and in the tourist season hawks them in the various towns. Although the sun is extremely hot in the country he has been known to walk thirty or forty miles a day, going from one town to another with the baskets on his head. Each large basket is filled with smaller ones, which make the weight very considerable.

one of increasing physical self-control and greater mental balance.

For as long a time as there is no feeling of fatigue the exercises may be repeated frequently, and may be varied with the practice of one arm at a time and the closing of one nostril.

the left arm, having the left nostril closed.

When a pupil has thoroughly mastered this exercise, tensity is combined with it by holding the right arm in a horizontal position and a left finger against the right nostril while a deep breath is taken and held for about five seconds. Meanwhile

the extended arm should be made to stiffen from the wrist to the shoulder and then from the finger tips to the wrist while the lungs are being expanded with the imprisoned air. In the first lesson five seconds is considered long enough before relaxation occurs. As the breath is gradually expelled the arm should relax from the shoulder to the wrist and from the finger tips to that point. As the arm slowly becomes limp the elbow should be drawn in toward the side of the body and the fingers curved upward. After exercising each arm in this manner for ten or twelve times the two arms may be raised together.

Since physical self-control cannot be gained without mental concentration, what are called "dead still" exercises are taught, by means of which one acquires magnetism and concentration.

"DEAD STILL" EXERCISES GIVE CONCENTRATION.

One of these exercises is to sit perfectly still in a chair with the eyes fixed upon some clearly defined object—a picture frame would do—for a period of five minutes to begin with, increasing the time eventually to a few minutes more. During this exercise not a muscle in the body should move, and this means also that the eyes should not blink. This exercise is varied by another in which the eye is fixed upon an imaginary line on a level with it and slowly moved, with a steady, unwinking gaze, along the line.

This simple exercise is said to strengthen the eye and impart to it and the face an expression of composure which adds greatly to their beauty. Better still, the exercise is calculated to develop magnetic brain force.

A Hindoo teacher suggests using a little stick or roll of paper during the breathing exercises for the purpose of assisting one in acquiring concentration. The paper or wood is held firmly in the hands while the lungs are slowly filled with air. When these are filled to their utmost capacity the tensity of the hands should be greatest, and, if possible, the air should be retained in the lungs for a period of five seconds and then slowly expelled while the muscles of the hand are gradually relaxed until, at the expiration of the exercise, the paper is held limply in both hands and the lungs are quite empty of air. This exercise, it is said, creates an electric current, the effects of which are highly beneficial to the nerves.

PRACTICE IS GREAT AID TO NERVES.

Another and simpler exercise for acquiring concentration of mind is for a woman to sit perfectly still for ten or fifteen minutes each day and let the mind dwell upon some one thing. No woman realizes the difficulty of this exercise until she tries it and finds how great a centrifugal and how small a centripetal force her mind is possessed of. The game of chess, when not played to excess, is also useful in acquiring concentration of mind and in exciting the mental faculties. The Hindoo teachers, however, do not include this in their program.

Occultism teaches not only magnetic force and beauty in the face and eyes—together with absolute control of the nerves—but, what is a most charming

quality in woman—a magnetic and flexible voice.

American women are too prone to speak in harsh and rasping accents, and they are only beginning to realize that there is a beauty in the modulated tones of the English and European women which Americans, as a class, do not possess.

The oriental cure for a harsh voice is to test the tensity of the throat muscles by holding the hand against them while one is speaking. If the muscles are hard they must be made to relax while the hand is still held against them. When the muscles of the throat are soft and loose the voice should be soft and melodious; and it will acquire still greater strength and vibration, which will greatly add to its charm, if the energies of the body are allowed to flow directly into it without being interrupted by any tension of the muscles of the throat.

The search for beauty, in its various forms, is older than history, and American women who learn nerve control as taught by the Hindoos learn it, not because it rests their nerves and develops forces of health within them, besides giving them a greater power of resistance against the wear and tear of society, but because it gives them additional beauty of countenance, a more charming expression of the eyes, and a reposeful manner that is extremely fascinating.

THE ATTAINMENT OF SELF-CONTROL.

HOW TO COMMAND SUCCESS.

Immanual Kant, one of the greatest philosophers of all time, said: "Two things there are that fill me with unspeakable amazement and awe, the starry heavens above and the moral law within."

Law that governs the heavens is visible and demonstrable, law that governs the moral conduct of mankind is immediate and self-evident.

As the power has been given to the human mind to use physical laws for his own advancement, it is reasonable to believe that power has also been given him to use mental and moral laws for his betterment and welfare.

It does not need demonstration to any one that there are invisible forces of aspiration, righteousness and love which are for us of more importance than all the splendors of the visible universe. We have invented microscopes to extend our sight one way into physical nature, and telescopes to prolong our power of perception the other way. By other means we have vastly enlarged our range of comprehension and physical strength.

These are merely the outer things, the tentacles, as it were, of our narrow life. It is only the soul within that you can call I, and it is surrounded with a physical structure of passions and emotions through which we come in contact with the ponderable substances of physical sensation.

We spend most of our lives in trying to increase our command of the physical good things of the world, and, perhaps, if we are religiously conscientious we spend some time in "mortifying the flesh," for the sake of our souls, but we mainly lose sight of the fact and fail to grasp the truth, that the soul can attain to what it will uninfluenced and untouched by flesh or environment.

ONE SIGNIFICANT AND IMPORTANT FACT.

The great fact is here: IN PROPORTION AS WE ARE DEVOTED TO THE WANTS THAT COME TO US OUT OF OUR SURROUNDINGS, THE SOUL IS THAT FAR A SLAVE TO PHYSICAL CONDITIONS.

Thus the child's wants are all born to it out of its physical surroundings. As a result, it is "pleased with a rattle and tickled with a straw." It cries for the moon and is thrown into mental suffering because it is not allowed to play with fire, knives, china ware, and other things that it wrongfully craves. It chases butterflies, kills birds, and increases its physical ideals and desires until they may have full possession, and the control of soul desires and satisfactions is lost. The Christian Bible and all the moral philosophies of the world, are full of admonitions for self-control toward soul, rather than physical or worldly attainment. IT IS INDISPUTABLE THAT SOUL STRENGTH CAN BE ACQUIRED.

Courage and energy are the pathfinders of mental acquirement. What boy has not quailed before some ghostly darkness and then attained sudden courage and energy with the exclamation, "WHO'S AFRAID? I'M NOT." There might be momentary relapses into fear as he entered the doubtful place, but his strength was renewed every time he asserted, "I'm not afraid."

This illustrates the soul-strengthening process of positive assertion. Such assertions are continuous encouragements or courage makers. It also shows why fear and worry are so weakening. They are constant discouragements or courage destroyers, against which the mind can not hold up, and moral or nervous prostration ensues. "I think, therefore, I am," said the Cartesian philosophers, and it naturally follows that "As a man thinketh in his heart, so is he."

ANOTHER SIGNIFICANT AND IMPORTANT FACT.

THOUGHT CAN TRANSFORM A MAN. IT CAN STORE HIM WITH POWER. That much is the dictum of both scripture and nature. It is our divine resource for growth and progress. But great things are not done for persons or by persons at a single stroke. Strength is not an instant gift. Labor acquires it and passes it over to the custody of habit.

To gain a given attitude of mind toward a thing is as difficult as to gain an erect posture when we have become accustomed to stoop, but either can be acquired.

We make our world according as we fear or aspire, determine and execute. "I wish I could," and "I can" are the two expressions that indicate respectively the unsuccessful and the successful man.

To the person wishing for success say this: "You can succeed if you will," and, should he answer, with the question "How?" you may know that in such a state he will fail. This does not mean it is the indication of failure to apply for advice or help. It is the state of uncertainty that means failure. Neither "fate" nor "luck" has anything to do with success, for, to inherit an empire greater than Napoleon had, is in no sense to be a success as a warrior or statesman.

Those in despair need only to cultivate their will-power as those who have feeble arms need to cultivate their muscles before they can lift heavy weights.

VALUE OF SELF-GOVERNMENT.

Those who desire to be successful, and are not, have simply not given attention to self-government. They are not trained to perceive and to persevere. Therefore they are unreliable and have not the confidence of themselves or others.

Huxley says. "The most valuable result of all education is the ability to make yourself do the thing you have to do when it ought to be done."

Milton said: "He that reigns within himself is more than a king."

The pugilist who expects to overcome his adversary and be declared champion of the world goes into long, severe training, and is our moral nature less worthy of being prepared to overcome its adversary?

The power to make yourself do the right thing is an irresistible force for progress and success. That power is self-control and may be acquired.

Is there something you want to accomplish that ought to be done? Then command yourself to do it every time you feel yourself falter, and it will be done. Do not command yourself feebly or the results will indeed be feeble. But, throw your soul into it and cry vehemently: "Do this thing! Do it! Do it!" And then as earnestly answer: "I will! I will! I will!"

Any one doing this will be amazed to see how quickly courage will come and worry cease.

INJURY OF WORRY.

Worry is to the mind what the tremors of palsy are to the body. Worry is uncertainty of direction and it is the dissipation of energy. No one can succeed who worries; no one ever has succeeded thus. It weakens every constructive process and everywhere breaks the web of design. Therefore, command your mind to cease its folly. The question is often asked: "Why does one succeed and another fail?" Half the time it is not because the successful person has more brain-power but because he has less friction and concussion in the machinery of his thought; that is, he has more self-control. He has the balance, poise and confidence that not only beget and sustain faith in his own success but point him out as a reliable man about whom others rally for given enterprises.

Fear, worry and unrighteous anger are similar emotions from lack of self-control. Neither one of these, nor any of their kind, could exist if the victim had a trained self-possession. "Anger blows out the lamp of the mind," says Ingersoll and the psychologists are all agreed that it is not an intellectual manifestation, unless it be directed by design. It is a mental action that is nearest the flesh, and in no two persons are the causes or characteristics the same. One will be angry at what another will not notice and all persons are differently influenced by the same emotion. Some become flushed and some pallid by the accelerated or retarded action of the heart; many have therefrom a dry mouth and throat or the opposite; others become faint as the emotion subsides; a few are made bilious or are nauseated, while in almost equal numbers it makes persons noisy or silent.

As this is one of the most powerful emotions to which the mind can be subjected and as no one thinks of denying that by practice it can be controlled, it

follows that every other emotion can be controlled by any one who is master of himself, or desires to be master of himself.

Probably the two most powerfully corrective thoughts ever uttered in the world are these, "Know thyself" and "Control thyself." Both are easily acquired and then the individual is indeed better than "he that taketh a city."

Hypnotism is little more than induced belief. It is found that one who practices self-control, as he would train a muscle of his arm for any purpose, can induce his own belief and thus strengthen himself to any purpose necessary for success.

Thus, whenever one is pursuing a difficult undertaking, let him, every time he feels himself falter or begin to fear, stand erect, breathe deeply and regularly, and say over and over with each breath, for five minutes, keeping his mind in full sympathy, "I can! I can! I can!" He will then have confidence. Then continue another five minutes asserting vehemently, "I will! I WILL! I WILL!" and unlimited courage and will-power is at hand.

AGGRESSION AND SUCCESS.

The man who slinks, the man who says can't, the man who fixes his eye on hardships never arrives at anything but hardships. Suppose a thing looks hard, that makes no difference, push ahead. Did you ever see a piece of work accomplished that you had thought too hard for mortal hand and brain? Did you yourself ever learn to do a thing that you had believed impossible for you to accomplish? When you look back what do you find made the new work you stumbled over so hard, so impossibly hard? Your opinion of it, the strangeness of it—nothing more. As soon as you began to push in dead earnest the seemingly impassable road opened up.

You can spot the man who lacks push by this one sign; he thinks no one else has a hard time but himself. He always talks of the obstacles he has encountered and his heroic efforts to overcome them. He just as invariably thinks and talks that things came easy to John Jones, who succeeded. He will tell you—if he gets the chance—how he suffered and bled and almost died because circumstances were "agin him." He will tell you how he had no advantages as a youth, or no health, or how big corporations squeezed him out of business, or how his friends swindled him. He'll rake together all the excuses he can find as a kind of defense and then he'll stand behind that bulwark and tell you how no one on earth ever tried harder than he did or ever deserved success more. But because of such and such difficulties, unforeseen, unconquerable, he failed.

FAILURE THINKS OTHERS LUCKY.

But just you point out somebody's else success and see how quickly he'll change his tune. "O, that was just luck," he'll say. "Anderson happened to go to work for that firm just when they needed him and he fell right into the routine work and they simply forced him on up. Why, he couldn't help but succeed. His work is just a matter of habit, routine, now; anybody could carry it on after once getting started."

If you suspect a man of lacking grit and push, just get him to talk about some other man's success. If he is a quitter he will never give any man credit for succeeding where he failed.

This isn't just willful obstinacy or wounded vanity either; the man who lacks sand, the man who hasn't the grit to push on against difficulties, really doesn't know how success is won. He does not know that it is his own weakness of character, the weakness that cons over hardships, supposed injustice, obstacles, what not, that has made him fail. It is the load he carries that is his handicap.

THOUGHTS OF FAILURE PARALYZE.

The man who succeeds sheds disappointments, thoughts of failure, as a duck does water. He knows that if he lets them penetrate they will become a part of him, they will change him. He can't afford to make a part of himself such elements of weakness. He can't afford to keep with him the things that neutralize and even paralyze his powers.

Do you take comfort in counting up your difficulties and hardships? Does it seem to you that no one else ever had so many obstacles to contend with? You are cherishing the things you ought to cast from you. You are on the wrong track if that is your state of mind: There is no thoroughfare that way. You are groping in a blind alley, a cul de sac.

When you catch yourself dwelling on the obstacles that block your passage, pull a tight rein on yourself, for whining is a sure sign of failure. Whining means a will too weak to push ahead and conquer hardships.

Do you see a lion in the path? Well, glare back at him. Maybe he's only a stuffed lion. You remember the creature that terrified Mrs. Stetson's little hero in "An Obstacle"? You remember how dismayed the hero was at first; how he tried prayers, threats, and polite entreaties, yet that obstacle didn't budge. As a last resort he tried ignoring the creature and pushing right ahead, as he himself tells:

"I took my hat, I took my stick,
My load I settled fair;
I approached that awful incubus
With an absent minded air,
And I walked directly through him
As if he wasn't there."

Half the things that floor us belong in the same category with this terrifying creature.

GRIT THE PRICE OF SUCCESS.

But there are some obstacles that won't down before an absent minded air. There are some that you must fight tooth and nail. Then it is a question of how much you care for success. Some people who talk about hardships are too downright lazy and selfish to work. They want to accomplish great things, but it's hard work to push. So they sit down and rub their bruises and tell why they can't go on. But they never admit they are lazy. No, no. They have been abused, unjustly treated by fate.

What are you willing to pay for success? Ease, comfort, leisure? Are you willing to work for things as Lincoln did? When he decided that he ought to study grammar he walked six miles to borrow a book and then sat up half the night studying. He didn't waste time

thinking how impossible it would be to learn grammar without a teacher. When he mastered grammar he borrowed another book, and when he couldn't afford a light at home he found a neighbor who let him read by the firelight. He kept his eye on what he wanted, and no matter what was in the way he kept moving in that direction.

PUSH OR STAND STILL.

Resolutely to push forward, to make sally after sally in the direction you want to go, is the only way to conquer obstacles. You can get through the densest crowd if you know how to use your shoulders, if you take advantage of every little opening. But you have to be alert and quick and you have to keep up your pushing if you don't want to get squeezed to death. If you stop pushing you will just be wedged in the crowd and kept at a standstill.

The man who resolutely and straightforwardly attacks difficulties gains power little by little. The only way to gain strength is to lean on what you have. The power of the athlete is the result of long continued practice, the product of thousand times repeated efforts. Helen Keller, deaf and blind from infancy, learned at last to communicate with the world. She has written a book that shows no mean knowledge of men, nature and events; she has won the friendship of world famous men, and now, at the age of 24, has just been graduated from Radcliffe College. How astonishing are her achievements, representing, as they do, such patient perseverance, such indefatigable determination.

Hardly less remarkable have been the labors of her teacher, Miss Annie M. Sullivan, who for seventeen years has been leading the blind girl "up out of Egypt." What examples the lives of these two heroic women are of the power of push! They kept steadily moving on, not stopping to moan over hardships. They could have done no other way to have crowned the long stretch of years with so many successes.

Is there something that you want behind that hill of difficulty? Stop thinking about the obstacles and simply push ahead. Don't be a vegetable; don't take root in your tracks. If it is only an inch, go forward.

THE GREATEST FORTUNE TELLERS.

Every human being yearns to look into the future. A man may think himself wise and above petty superstitions—but how solemnly and earnestly he listens while some foolish young girl or wrinkled old gypsy talks about the lines in his hand.

He would not listen to such a person or be influenced by her ordinarily, but old superstition makes him give close attention to foolish talk about the future.

This universal interest in fortune telling, an old inheritance, makes us all rather foolish at times.

It might be made a useful thing if we could get into the habit of telling our own individual fortunes, instead of relying upon hysterical or swindling clairvoyants.

You, the young man reading this, should make up your mind to be your own fortune teller.

The usual soothsayer with the itching

Powell-Clayton at a perilous moment in his exploration of the African jungles.

palm looks at your line of life, your line of luck, your line of fate, etc., and she reads your future according to the length and strength and general behavior of these lines.

But you can tell your own fortune better than she can.

Don't look into the lines of your hand; look into your heart, into your mind, into your ways of living.

It does not matter how long a distance your fate line may run; but it does matter a great deal how long you are able to stick at a thing that you have once undertaken.

Don't believe the gentle witch who tells you that you will fail because your line of fate is broken.

But tell yourself that you will fail because your line of effort is so often broken.

Never mind the life line or its vagaries. That line has nothing to do with your life or your death. Its shape simply shows how you happened to close your hand and form its wrinkles when you were an unborn baby.

But there are other lines that you can read, inside of yourself, and these will tell you some truths about your chances for a long life—or a short one.

If you see in your past life a long line of cock-tails before breakfast—or after breakfast for that matter—you may predict for yourself a not very long and not very useful life, and be proud of your accuracy as a prophet later on.

If you see in yourself other lines of foolishness—late hours, dissipation—if you find yourself sleepy as your work begins, when you ought to be at your best—you may safely predict for yourself shortness of days and lack of usefulness in them.

The present fashion among fortune tellers and their dupes is what is called "the reading of the crystal ball." The wise old gentleman or lady who makes money out of the foolish ones looks into the crystal ball and then spins a marvelous tale of things seen there concerning the future.

The crystal ball, of course, is a fraud or, at the best, self-deception on the part of the fortune teller.

But every one of us possesses a crystal ball, more or less clear, more or less cloudy. That crystal ball is our own soul, our own consciousness, and in it, if we will, we can read the truth about the future very clearly.

To be your own fortune teller does not require any very great preparation; no hours of fasting or special diet are necessary.

To be your own fortune teller you have only to cast out self-deception.

Stop fooling yourself, and look honestly into your own character. You can read there pretty accurately what is going to happen to you. And, best of all, you can not only tell your own fortune, but you can control it, if you will be guided and warned by the weaknesses that you see in your own personality.

Don't look at this picture in a careless way. Don't read this editorial or glance it over with condescending good nature, saying to yourself, "I know a lot of people that might well investigate their own characters."

Apply the advice that is here given to yourself. Make an experiment as your own fortune teller. Take an hour by

yourself, look into your own mind, study your own weaknesses.

Tell yourself truthfully your mistakes, and follow along the lines of your misconduct to their final, inevitable end.

If you are a gambler, you can see in the crystal ball disgrace and failure in the end.

If you are insincere, you can see loss of friends and self-respect.

If you are inclined to drink, you can see a life wasted and withered toward the close.

If you are selfish, you will see in the future the lonely bitterness that selfishness brings.

Try to read your own fortune, and be guided by what you see in your crystal ball. Your time will not be wasted.

THE CHINESE AND CONFUCIUS.

Confucius was a sage who has held the obedience and loving direction of his entire race for more than twenty centuries, an achievement without parallel in the history of mankind.

A PURELY SECULAR TEACHER.

This is the more remarkable because "the theories and teachings of the great Chinese sage were entirely secular."

They deal exclusively with the relations and duties of man to man in this life, and neither bore reference to or made account of a higher Being, or Beings, or a future state of existence. His disciples have left upon record four subjects upon which he seldom spoke. One of these was spiritual beings and a future state. In answer to a question from a minister of state as to what constituted wisdom, the sage replied: "To give oneself earnestly to the duties due to men, and while respecting spiritual beings, if there are such, to keep aloof from them—this may be called wisdom." Being asked by a disciple concerning ancestral worship, which then, as now, was universal in China, he answered: "While you cannot serve men, how can you serve spirits?" Asked by the same disciple concerning a future state, he replied with the counter question: "While you do not know life, what can you know about death?"

HIS THREE WORDS.

Confucius condensed the whole of his teachings into three words—*Li, Shu,* and *Chiintz.* The significance of these is thus explained:

Li means the primary and the ultimate law of right action, and implies doing the right thing at the right time in the right way, and from the right motive. *Shu* was explained by Confucius as equivalent to the Golden Rule:

"What you do not wish that others should do unto you, do not unto them." The Chinese character, *"shu,"* includes consideration, charity, forbearance, thoughtfulness for others, mutuality of rights and interests. It covers the entire principles of the brotherhood of man put into practice. The English equivalent, as used among us, involves only the commercial idea of "give and take."

Chiintz can only be translated as "a thorough gentleman":

The gentleman, in dealing with others,

does not descend to anything low or improper. The gentleman enters into no situation where he is not himself. If he holds a high station, he does not treat with contempt those below him; if he occupies an inferior position, he uses no mean arts to gain the favor of his superiors. He corrects himself and blames not others; he feels no dissatisfaction. On the one hand, he murmurs not at Heaven; nor on the other, does he harbor resentment towards man. Hence the gentleman dwells at ease, entirely waiting the Heavenly will.

HOW THEY WORK OUT IN PRACTICE.

With few exceptions every peculiarity and every virtue in the social or political forms, customs, and usages of the Chinese may be traced back to Confucius, their hero, master, and sage. He was strongly opposed to war and to standing armies, and taught the rulers of China to conquer their enemies by showing the excellence of good government. The Chinese today, whether taken *en masse* or as individuals, are the most peace-loving race in the world. Nowhere is that beatitude, "Blessed are the peacemakers," held so highly in honor and obedience.

THE CORNER-STONE OF CONFUCIANISM.

All Chinese children are taught the ethics which Confucius formulated 2,400 years ago. But the corner-stone of his system is older than that:

The Chinese sage had found in the ancient records the following declaration made by a king and hero twelve hundred years before he was born: "The great God has conferred upon the people a moral sense, compliance with which would show their nature to be invariably right. To give them tranquillity in which to pursue the course indicated by it, is the task of the Sovereign." Confucius accepted this statement as entirely correct, and upon it, as a corner-stone, erected his system.

POWERS OF REST AND PEACE.

The body is in normal, healthful condition when there is a sense of life and strength with no consciousness of any special part.

The chief good for the body is physical calm.

Spiritual calm is in the same way the test of inner health.

Gloom, despair, sorrow and turmoil are never necessary conditions. They are, as are bodily pains, symptoms to show that something is wrong. The normal condition of the mind and heart is a sense of life and strength attuned to quiet serenity. Inner calm is the equilibrium of the spirit.

What most impresses the student of the life of Jesus? Is it not the sense of strength and serene greatness?

He sleeps upon the boat while all His companions are terror-stricken by the surrounding storm. When He is awake to their tumult, He rebukes their terror and want of trustfulness and by His quiet strength rebukes the tempest, too, and stills the tossing of the waves.

At another time, overtaken by a storm when His disciples are alone upon the

sea, they see amid the darkness of wind and rain, and the glare of lightning, the figure of their Master coming to them in the very midst of storm and billow, and the gentle peace of His greeting calms the raging of the tempest and brings quiet again to their hearts.

The physical pictures here drawn are incredible to many, but can any one doubt the fact of their spiritual counterpart? The turmoil of trying hours would indeed be transformed into peace when there was among them a soul so centered in the divine. His messages would always bring quiet and strength into every storm of life.

The secret of all greatness is in having something akin to this calm strength.

Washington and Lincoln are permanently impressive figures because of the self-poise in their natures. This made the people of their generation feel, in times of calamity and combat, that one man, at least, stood impervious to excitement in quiet composure and unflurried power. They have given the same impression of strength to all the generations since.

In private life we all know persons who give the impression of reserved force. They are the ones whose calm spirits attract to them troubled hearts. They are such as have hearts at leisure from themselves to soothe and sympathize.

Persons who prove themselves thus to be victors in the stress of life have found nothing which may not be faced with clear eyes and trusting hearts. They have not missed the trials that come to all. They have risen to a plane where they could be transmuted into blessings.

AGE AND MENTALITY.

OLD MEN OF GREAT POWER.

One does not have to look far to find historical instances of old men wielding great power. Benjamin Franklin's best service to his country was rendered after he had reached 70. Palmerston was prime minister of England when he died at 81. Gladstone became premier for the fourth time at 83, and held the office for two years. Bismarck was 75 when the German emperor forced him from the chancellorship. Metternich also was driven from power at 75, and Crispi assumed the premiership of Italy at the same age. Talleyrand, dying at 84, had under successive French rulers been a power all his life. Pope Leo XIII. had no signs of intellectual decrepitude when he died of old age at 93.

John Adams and Thomas Jefferson, after retiring from active life, were fruitful in counsel until death carried them off on the same day at the respective ages of 91 and 83. John Quincy Adams was a power in the house of representatives when stricken at 81. Henry Clay at 75 was still a leader in the land.

ARTISTS OF ADVANCED AGE.

In other walks of life there stand out among musicians Handel, the original "Grand Old Man," who played the organ at a performance of his "Messiah" eight days before his death at 74, and Verdi, who, reaching the age of 87, was prolific almost to the last, and among painters the great Titian, who wielded his brush after he had passed his 98th birthday.

With some writers the idea of old age seems inseparably connected. Who thinks of Samuel Johnson, for instance, save as the ancient autocrat of Grub street; of Walter Savage Landor but as a bluff old lion, or of Samuel Rogers except as the nonagenarian giver of breakfasts. Goethe's name evokes the spectacle of the dying veteran with his cry for more light; Voltaire's that of his triumphal progress through Paris "with face shriveled to nothing," in the year of his death; Swift's that of the mad old man expiring, "a driveler and a show."

One even associates the idea of age with some who were not really old—as with Montaigne, who died at 59, or Thomas Fuller, who was only 53.

For all death's love of a shining mark, many an eminent author has reached a ripe old age, and often literary activity has lasted to the end, to the enrichment of posterity. Chaucer, who died at 77, did not write the "Canterbury Tales" till he was 63. That stout old Scotchman, George Buchanan, wrote his "De Jure Regni" in defense of popular rights at 73, and lived four years longer. Cervantes, dying at 69, had finished his immortal "Don Quixote" but one year before. Thomas Hobbes, who wrote his "Leviathan" at 63, lived to be 91. Izaak Walton's "Angler" was published when he was 60, and other literary work helped to fill the remaining thirty years of his long life. Edmund Waller lived to 83, and Isaac Newton to be 85.

John Home, the Scotch tragedian, who in the estimation of a youthful fellow-countryman had vanquished "Wullie Shakespeare," died at 86; Horace Walpole at 80, Isaac Disraeli at 82, Jeremy Bentham at 85, and Wordsworth at 80. Of those dying in our own days Carlyle was 86, Ruskin 81, and Browning 77.

Tennyson, whose age was 83, was tuneful to the end, and in "Crossing the Bar" left behind him a swan song of rare beauty. Victor Hugo lived to the same age, and to witness his apotheosis in the France that had exiled him. Herbert Spencer died at 83 almost with pen in hand.

The American group of splendid, though far from savage, old men may fittingly conclude the list. Washington Irving lived to be 76 and wrote his life of Washington in his last years. George Bancroft died at 91, the concluding volume of his history appearing when he was 82. William Cullen Bryant was 84 and Walt Whitman 73. Of the famous New England group Emerson died at 79, Longfellow at 75, Holmes at 86, Whittier at 85, and Lowell at 72. Hawthorne, dying at 60, was by comparison cut down in his youth.

THE CHILD AND PLAY.

Men must work and children must play; activity to the one is as important as to the other. These two expressions are not different, excepting that in play it is the exercise of this activity that forms the purpose of the exertion and rewards it with joy, in work the outcome is the essential part. But, by tempering and blending these two purposes they may become almost one, as is often seen in the work of the artist.

In the child thought is of value only

as it realizes itself in action. It is through activity alone that the child becomes conscious of his own possibilities and relates himself to the force he calls the world. For all experience is "just a stuff to try the soul's strength on."

NURSERY A CHILD'S UNIVERSITY.

To many women in these days the nursery is a place of secondary importance—a fortunate corner to keep the children with the nurse so that they will not annoy the rest of the household. In their blindness they fail to realize that the nursery is a child's university; it is in his play that he gains those experiences that are the foundation of his whole life. No one but a mother rich in love and intelligence is worthy of directing this worthiest of schools.

To assist the child in his self-activity nature has endowed him with the senses. The only way that these senses are to be trained so that the inner consciousness may be related with the outer world is through play.

It is hard to say just when the child first begins to play; he is conscious of his own activity long before he has any desire to express life as it appears outside of himself. When he is still young he kicks with his legs, plays with his hands, fingers and lips. This activity is the beginning of play.

LEARNING OF OUTSIDE LIFE.

But as soon as the child's body is sufficiently trained he shows a desire to represent the internal outwardly. This is real play. Still he has not yet learned to distinguish the life outside of himself from his own. He grasps after the sun as if he could take it to himself; the pebble and block of wood have as much life to him as a flower or an animal. It is therefore quite natural if he hurts his head against the table, to strike the wood for hurting him.

Before children can enjoy much play they must have some experience with color, form and sound. By playing with balls and blocks they soon learn to distinguish a sphere and a cube. By handling balls of many colors they soon develop color sense. By playing with their rattles and making all sorts of queer noises they train their ears to distinguish sound. At this stage the nursery plays are all important. There never will be a baby who does not enjoy the playing of "This little pig went to market," "Bye, Baby Bunting," and "pattycake." Mother Goose rhymes are an endless source of delight, for their rhythm if for no other reason.

TOYS DEVELOP IMAGINATION.

These simpler games learned, children long for toys so that they can develop their activity and imagination more rapidly. With a strong impulse for imitation, they long to enact the experiences of the people round about them. Therefore every little girl in every part of the world loves her dolls and all that is needed for the welfare of her babies. It is quite as natural for her to love her dolls and look after the welfare of her little ones as for her mother to care for her. She does not consider wasted time spent in the making of baby clothes, rocking her dolls to sleep, and singing them lullabies.

A boy's rocking horse and building blocks are the most wonderful objects

brought to earth. With his horse he can canter over hill and dale and through the land inhabited by giants. If he has not a rocking horse at hand he will ride upon a bar or the leg of a chair. Driven by his imagination, they will carry him wherever he wishes to go. With building blocks he can build wonderful bridges, stables and castles, and when once they are built they are filled with all sorts of people. Reality counts for little now; it is the imagination that needs stimulation, and fairy stories are the things children wish to hear about.

Gradually their imagination is awakened to the point where they can play without toys. Little girls, instead of playing with their dolls, choose from their own numbers mamma, papa, and children. Interesting as these plays are for the girls, they count for little with boys. The horse and the steam car excite their imagination. After children have played some time, there comes a desire to create for themselves. They want paints to try their hand in the use of color; the clay and sand pile to work in form. In winter time they delight in fashioning a snow man and house.

Besides their playmates and toys they long for pets. A few years earlier the toy dolls and rabbits were worthy companions, but in the meantime they have learned that these toys are not real. They now ask for pets they can love and play with which will be subservient to their will. Little girls choose kittens and rabbits as their best friends, but boys prefer dogs and mice. Every child should have at least one pet as a friend. Not only do the children soon get to love animals, but the dog in turn soon learns the child's voice, the kitten the soft caress, and the rabbit to nibble for food.

All too soon the play days of children are over and work begins. The joy of doing is at an end and knowledge becomes the goal. Surely it is not to be wondered at that when this end is too strongly emphasized pleasure in work ceases. This effect must be counterbalanced by plenty of play.

THE JOY OF CHILDREN.

A SCIENTIST'S STUDY OF THEIR ENTHUSIASM.

First of all we may learn from the child how to get the full enjoyment out of life. Many things which appear commonplace and uninteresting to us may become sources of keen enjoyment to us and this—how to enjoy life in all its everyday and apparently monotonous incidents—is of the highest importance to our happiness.

We have as a rule early lost the ability to enjoy the faculty of feeling happy even if we are not millionaires beset by spleen and neurastheny. Even the most normal man no longer possesses the ability to feel joy as does the child under all circumstances. He has lost the faculty of turning his misfortunes and adversities into happiness. If he misses a car or his train or is delayed on his way he is ready to sulk and be impatient all the rest of the day.

We get nervous and cranky when it rains. When the sun shines we declare that we are dying from heat. If we go

Executing two Japanese officers as spies. The Christian officer refused to be blindfolded.

into the country we find it slow and dull, and the noises of the city jar on our nerves.

When we get a new dress or hat we envy those who can afford to get one that is more expensive. We have not entirely lost the sense of enjoyment; it is only slumbering, and it takes something strong and unusual to wake it up, and generally this is something that is out of our reach.

Here is the point on which we may learn a valuable lesson from the child, who understands to perfection how to find ways and means to provoke joy.

AN EXAMPLE OF PERFECT HAPPINESS.

If you observe the children who surround you the first thing which strikes you is their perfect happiness, their satisfaction with themselves and their surroundings. The smallest of them are firmly convinced that their bed, their plate, their dress, their dolls are the prettiest in all the world, for the sole reason that they are theirs.

"How beautiful it is, how warm it is, and what fine bows there are on it," one of my little nieces said one day of a rather shabby looking muff which she carried. "And just because it is mine," she added. She admired it only because it belonged to her.

My own little child of four years covers a slip of paper with pencil marks and triumphantly runs over to show it to me.

"Read it," he cries. "I am sure I have written something very pretty." He does not know what his pencil marks mean, but does not for a moment doubt that they must mean something beautiful, because he has made them with his own little fingers.

The daughter of Dr. Max Nordau, the famous author, an unusually bright child of three, had a most characteristic way of expressing her contentment with herself by adding her own name, Maxa, to anything which pleased her. To designate a beautiful tree she said "a Maxa-tree," a book with fine pictures was a "Maxa-book," and she had "Maxa-gardens," "Maxa-flowers" and "Maxa-dogs."

Her name, her own self, was to her the embodiment of everything that was beautiful.

Everybody knows how children love to brag and how boundless is their ambition, a fact which has its reason in their vanity and self-contentment. To become a king, a general or a count is the easiest thing in the world to them, and they only have to make up their minds to become one of these exalted personages, and if they a few minutes afterward become bandits, robbers or coachmen it is not from modesty, but because the personality of a bandit, robber or coachman momentarily appears more fascinating to them than that of a king.

The most commonplace things and incidents become sources of joy to them, everything looks cheerful and bright to them, because they do not derive their joy from their surroundings, but have the elements of joy in their own selves. I have observed this hundreds of times in my own child, who in everything mentally and physically is an average child, but the faculty of enjoying himself is so strong in him that it is marvelous.

If, for instance, he hears a bell, he stops and listens with a smile, even if it is not

the dinner bell, and when it happens to be the dinner bell his joy is boundless.

DELIGHTS OF COMMONPLACE THINGS.

Another most interesting amusement is to move the door of a closet back and forth, or to jump through a ray of sunlight which falls through the window into the room. As a rule, he dislikes intensely to leave his toys and our pleasant company to be put to bed, but if I tell him he is to play hide-and-seek under his coverlet he will run toward his bedroom radiantly happy. It is the same with his bath—he hates the sensation which the cold water gives him, but if I tell him he is a little fish, which can swim and splash around in the nice, clear water, he forgets entirely the unpleasant change of temperature.

At the table the mere sight of the luscious grapes, oranges and peaches of the dessert is a real joy to him, just as a painting by Leonardo da Vinci or a statue by Michael Angelo is to us. He loves to have me cut his bread into little cubes, which he throws into his soup plate and which his imagination changes into ships floating on the ocean. He keenly enjoys the sight of his own face reflected in the hollow of a bright spoon, and when he is through eating he never forgets to tell himself that he will soon have another meal.

When I take him out for a walk it is the same thing; then he will gather chestnuts or pebbles, or he will jump across a space of maybe a foot, exclaiming proudly that he knows how to fly, and the show windows of the stores are inexhaustible sources of delight to him.

Now there is nothing to prevent grown people from enjoying the same pleasant sensations. To be sure, the gathering of pebbles or chestnuts has lost its charm to us, but we still have the beauty of the scenery which surrounds us, the changing lights of sunshine or rain on trees or walls and roof, the clouds and the sky, the throng of people in the street whose faces often give you a key to their souls and character; but, no, "we have no time" for observations of this kind. Our imagination needs stronger stimulants, exciting events, unusual scenery, to be set in motion, but only because we ourselves have allowed it to lose the sensitiveness and buoyancy which it originally had.

And still, contentment and joy are necessary to our welfare, mental as well as physical. We all know that when we feel happy and satisfied we eat better, sleep better, feel better in every way, are more optimistic, so that we overlook many little unpleasantnesses which we would enlarge on when in our usual morose and cranky humor.

The child understands how to make the best of everything, so that it is always in the mood which is best for its organism, and this we would do well to imitate. We should learn to create joy for ourselves by trying to look at the pleasant side of everything, and we would soon feel the immense benefit we would derive from the experiment.

GALLANTS AND FLIRTS.

What shall we do with our "Major Whites"?

The "Majors" are handsome men, very handsome, and very winning men, who appoint themselves the entertainers of other men's wives merely as a matter of friendship. If there is a Major White calling at your number, what are you doing with him? If you are a Major White what is your view of the case?

A man who calls himself "A Perplexed Husband" has written an appeal to a newspaper, and it represents such a common source of misery and divorce that the letter has been reprinted and commented upon in most of the principal newspapers of the United States and England. He asks what he shall do with the particular Major White that has found companionship in his home. In the appeal he asks if "intimate friendships and frequent meetings between married men and women with others than their own wives and husbands are proper?" And if it would be wise for him to acquaint his wife with the fact that her friendship with Major White is intensely disagreeable to the perplexed one.

The writer of the letter is not quite sure that the Major is a very discreet man. Nor is his mind quite settled as to whether the Major is a rascal.

TURNING THE TABLES.

And there is another phase of the question which is equally puzzling to the man whose wife likes Major White's company. Would he be justified, as his wife asserts, in kindling a little flirtation with another pretty woman? In short, ought he turn the tables by becoming a Major White himself?

Then again: If a man is the husband of an ugly wife, is there any excuse, under any circumstances, for his seeking the company of a neighbor's pretty wife? That is the very thing the Major is doing.

And yet again: Has a good wife any excuse in the world for striving to please any man except her husband? This particular wife tries to please the Major first, her husband next.

To the Editor.—For reasons which will appear obvious, I write you without a date line. My wife is an exceedingly attractive woman, mentally and physically. A few months ago she met a gentleman whom I will call Major White, because that is not his name. He is, I think, the handsomest man I ever saw. She and the Major soon became great friends, and he has been at my house frequently since then, sometimes when I was away, for I am so involved in professional affairs that I cannot attempt to participate in one-tenth of the social events which largely occupy my wife's time.

Of late I have felt vaguely disturbed by some things I have noticed, which possibly should not annoy me at all. Permit me to rehearse them:

1. My wife dresses her hair in a style which she knows I do not admire, but which Major White called to her attention as ideal, and which she adopted at his suggestion. This seemed to me impertinence in him, and in my heart I resented it.

2. When Major White was called away to a certain city on business she expressed to me a desire to visit friends there at the same time, and he arranged to take her out to the theater and to dinner while there—all in my presence, and seemingly entirely as a matter of course, without a thought of impropriety. I gave no hint of my profound conviction that such a program was indiscreet, but I took care that my wife's proposed visit should become impossible.

3. Major White is often my wife's escort home from late social functions which I am unable to attend. His wife rarely goes out, and, by the way, is an unusually homely woman.

4. I cannot but notice a marked increase in the vivacity and amiability of my wife when Major White is with her, and she often blushes when in conversation with him.

5. Major White's demeanor toward me is curiously variable. Sometimes he is effusively cordial, at others stiff and distant. And there seems to be an indefinable change in my wife's manner toward me. I feel myself a bore to her occasionally.

6. My wife is always present at places where Major White is a guest, and has been little inclined to go to places where I found him absent.

7. There is a talented and pretty woman in our social circle who has shown a fancy for me, and has repeatedly invited me to call on her. I should have been pleased to go with my wife, but I have felt a repugnance toward going alone, because I doubt the propriety of an intimate friendship with any woman other than my wife. My wife, of course, knows this lady's kindly disposition toward me, and rallies me constantly because I do not call upon her. She tells me it would not only be proper, but that courtesy demands it of me. She has even said, in a joking way, that a flirtation between this lady and myself would be very amusing to her.

I shall not attempt to dodge a fact which no doubt is already apparent to you—that I am tinged with jealousy. I have always regarded jealousy as an ignoble and contemptible passion, and I assure you that my wife does not dream how closely I have scanned her relations with Major White. It is only an intangible fear of ultimate trouble and a consciousness of the possibility of grave mistake that constrain me to write for counsel in the unprecedented situation which now confronts me.

Are intimate friendships and frequent meetings between married men and women with others than their own wives and husbands proper?

Is the conduct of Major White and my wife, as described by me, such that I should disapprove it?

Would it be wise for me to acquaint my wife with the fact that her friendship with Major White is intensely disagreeable to me?

Understand, please, that during the ten years of my married life my affection for and trust in my wife have never wavered, but lately I have feared that the admiration and compliment, if not the love of another and a very able and winning man, may have placed her in an insecure position.

A Perplexed Husband.

The newspaper published this letter and asked its correspondents to answer the perplexed husband. The thousands of replies varied all the way from "get an axe" to "get a divorce." Most of them denounced all three as fools.

MARRIED HAPPINESS.

In the good old days before women were emancipated they were content to stay at home and minister to the needs of their lord, their children and their household. Matinees, summer sales and afternoon teas were unknown. Our grandmothers were not always racking their brains for some fresh diversion, some new way of killing time. They lived simple, healthy, frugal lives, and (in spite of the swooning they are represented in the novels of the period as indulging in) had a more tranquil nervous system.

The woman of today is constantly craving for excitement. If she be of the lower middle class she passes her nights in heated salesrooms, bidding frenziedly for articles she does not want; if she is of the upper middle class she disports herself upon some promenade, or wears herself to pieces over parish work. To sit at home is the only thing she detests.

Now this is unfortunate, because man (a far more conservative animal than woman by the way) likes nothing better than to sit by his own fireside, with his feet on his own fender, smoking the pipe of peace. While his fiancee pictures matrimony as a whirl of calls and parties, he dreams of a quiet haven sheltered from every wind which blows, a place where, once the turmoil of the world shut out, he can rest and refresh himself for the recurring struggle.

If you really wish to make your married life happy, you must give up all thoughts of your own pleasure, you must abandon the idea that rushing to and fro is desirable. You must settle down—never mind if it sounds dull—and determine to make a home for your husband. Never mind about the carpets or the curtains; these count for nothing; make it a place where the sunshine of serenity shines, a place where worries are kissed away and cares forgotten, a place where cross words and angry looks never come, a place where discontent cannot live, and, above all, a peaceful place, where he may gather strength for the struggle always going on—the struggle of life.

THE KIND OF GIRLS THAT MAY BE HAPPILY MARRIED.

There are few girls who seem to realize what a man really requires in a wife. It is necessary that a girl who wishes to be happily married to a good and true man should remember that in choosing a life partner a man invariably decides on a woman who, were she a man, would be his best friend and closest companion.

Some men, of course, marry their opposites. But the majority incline toward the woman whose tastes, characteristics and sympathies are identical with their own. There are many girls who cannot take an interest in a man's pursuits and ambitions in life. They live in a purely feminine world, so to speak, composed

Waiting in line for tickets to the public bath in Chicago. Showing the interest of boys in this most useful of public utilities.

mainly of dress, fashion and amusement. Occasionally they may dabble in domestic work; but they regard the latter in the light of a novelty, instead of something to be seriously undertaken and thoroughly learned, in order to fit them for the position of wife which they may one day attain.

To them a man's work and ambitions are as difficult to understand as the Greek and Hebrew languages. They hope the man in whom they may be interested will succeed in what he wishes to do, but beyond that they are not capable of thinking or acting with him.

A man wants more than this from the girl he is to marry. She must sympathize with him and his ideals, and not only sympathize, but gain some intimate knowledge of his work and ambitions, so that he may be able to talk to her and be understood. By tactfully inviting a man to talk over his worries and difficulties, a girl can learn all she needs about his interests in life. And it is surprising how a man will be drawn to her in consequence. It is to her he will come to talk over his triumphs and failures, knowing full well that he will obtain delightful praise, or sympathy and comforting words, which will encourage him to make another start.

The simpering, gushing, frivolous girl does not appeal to the average man. She appears to be too selfish. There seems to be little concern or thought for others in her nature. Of course, there are few men who like what may be termed the thoroughly serious-minded girl. She must be one who can amuse, and who exhibits at times those feminine foibles which make a woman so dear to a man's heart. At the same time she must be capable of deeper feelings, and the girl who can combine these characteristics has by far the best chance of marrying.

The practical-minded girl, as well as the serious-minded, is much sought after by men in search of a wife. A man knows a girl has domestic qualities when he hears that she makes her own frocks, and thinks a thing may be as fashionable if it is inexpensive as if it is costly. If she can tell how a dinner should be cooked, whether she can cook herself or not; if she knows the value of ready money and has a horror of being in debt, then he knows that as a wife she will save money instead of spending it lavishly and recklessly.

And, young girls, let us tell you, be circumspect in your conduct at home, more especially when a prospective lover visits you. He knows, beyond all possibility of doubt, that the girl who is the best sister and daughter will make the best wife.

COUNTESS RUSSELL'S IDEA OF WOMAN AND THE HOME.

The chief sphere of woman's labor—that of the household—began to be destroyed by the progress of machinery. The spinning, weaving, needlework, baking, jam-making have all been transferred to the factory, and no public effort has been made to open up new occupations for women. One can see that a different class of women is employed in the factory from the middle-class women who last century did the domestic work in their own homes.

Women have been forced from their homes in order to make a livelihood, and

the majority of them still are looking for work and doing it not for amusement's sake. We have not been able yet to have all occupations open to us, and even in the ones we have forced ourselves into we labor under great disadvantages, such as journalism or medicine.

We are constantly hearing that the proper sphere of woman is the home, but it would seem that the wise ones of the age might make suggestions more to the point by showing how women may earn a living in the home.

THE USE OF DRESS.

There are many persons who spend less than a hundred dollars a year for their clothes and always look well dressed. There are men who spend ten times as much for their clothes and never look well dressed. The secret of good dressing is attention to the small things. An expensive suit, supplemented with dirty linen and unpolished shoes, looks shabby. A comparatively cheap suit, set off with shining shoes and immaculate collar and cuffs, gives the wearer the appearance of being well groomed. Old trousers carefully pressed and cleaned look better than newer trousers which are dirty and baggy. A spotless last year's hat looks better than a this year's tile which has upon it all this year's dirt. To appear well dressed costs pains rather than money.

Personal neatness has a commercial as well as an esthetic value. An employer does not like to have about him men who look unkempt and seedy. They make it appear that he either will not or cannot pay good wages or salaries—that he is either close fisted or unprosperous—and thereby his business is injured. Other things equal, the young clerk or bookkeeper or salesman who, no matter how small his pay, always keeps himself looking clean and well dressed, is the one who will be selected for promotion. Clothes don't make the man. They have helped in the making of many men.

BEAUTY COLONY IN RUSSIA.

At the time of the Russo-Turkish war M. Reshetnikoff, struck with the inferior, ill-nourished physique of many recruits, set aside annually out of his large fortune the sum of 10,000 roubles for the purpose of eliminating the unfit by encouraging marriage only between young people of exceptional beauty, health and intelligence.

To attain this end he employed as workers on his estate only the handsomest and healthiest villagers. These he encouraged to enter upon matrimony by free grants of land, payment of all marriage fees and an annuity of 50 roubles a year for every child born.

He succeeded in removing from his estate, by rather harsh means, all deformed and sickly persons and attracted handsome giants from all parts of the province by granting them valuable privileges. Those who refused to marry the partners he selected were unceremoniously deported.

Since the institution of this human beauty farm forty model marriages have taken place and over 100 children have been born, nearly all of them being immensely superior to the average Russian peasant children in strength and beauty. The girls in particular are remarkable for their graceful carriage and lithe, active forms.

A marriage has just been celebrated there with exceptional display, owing to the fact that the bridegroom and his bride are the first couple both of whom sprang from unions arranged by M. Reshetnikoff.

The bridegroom, a handsome peasant named Vasalieff, of splendid physique, and the bride, a lovely girl of 18, were driven to church in M. Reshetnikoff's carriage, and given as dowry a large wooden cottage and a plot of land.

SIDE LIGHTS ON CHARACTER BUILDING.

OBEDIENCE.

One of the first and most important lessons of life is the lesson of obedience. Not to know how to obey, not to understand the obligatory grip of duty, not to have tasted the hardening discipline of subjection to right authority, is the same thing as not to know how to rule, not to be able to point out duty to others and to inspire them to its performance.

Obeying when obedience is hard is the right school of character. It develops hardness and solidity. It makes men firm and dependable. It is the tempering which makes the metal fit for use. One of the great evils of our day is that this is not seen. We have come to dislike authority as such. Parents even adopt the theory of relaxing all bands of duty in the care of their children, and leaving things to their reason. If the children do not see it, let them wait until it is clear to them. Undoubtedly there is such a thing as arbitrariness and despotism, but there is also a loose and lawless freedom which is yet more fatal to character. Young people and boys and girls should train themselves in duty doing. They should have the highest standards of what God expects of them in character and service, and they should compel themselves to live up to these standards. The harder it is, the better for them. We ought all to be more exacting of ourselves than any one else can be of us, and we should be our own sternest rulers. We shall find one of the rarest joys of life in this self-sovereignty in the interest of duty in the success with which we are able to subject ourselves to obedience. To obey when duty is easy and to refuse when duty is hard is to exalt ease above duty, to put God's claims, which are the claims of duty, second to our own claims, which are the claims of ease. In other words, it is to make God subject to us. The voice of duty is His voice. To refuse to hear it is to refuse Him. It is when obedience is hard and we rise above temptation to neglect, and do our duty, whatever the cost, that we rise highest in our likeness to Him. To obey only when we want to is not obedience at all, unless we always want to. Obedience is the only valid evidence of love and faith, and the harder the test the more splendid the testimony.

LIES.

CLASSIFICATION OF PROFESSOR JOHN STUART BLACKIE.

1. Lies of carelessness, from loose observation and hasty generalization—any hour's talk full of them.

2. Lies of cowardice, from fear of facing the truth, as when a man labor-

ing under a dangerous disease reasons himself into the belief that he is quite well.

3. Lies of politeness, very common with women; taking the sting out of the truth, for fear of giving offense.

4. Lies of flattery, from a benevolent desire to please, or from a selfish desire to gain something by pleasing.

5. Lies of self-glorification, magnifying our own virtues or the virtues of the class to which we belong. This includes patriotic lies, sectarian lies, and almost any kind of lie that masks selfishness under a grand name.

6. Lies of malevolent hostility, consciously intended to deceive an adversary, as in war.

7. Lies of self-defense, to save nature when a force is put upon her; or to save one's life where honor is not concerned.

8. Lies of benevolence, as to save another's life, as when a righteous man flies to you for concealment, hounded by his persecutors, and you say he is not in your house.

9. Lies of convention, as when you call a man a gentleman who is not a gentleman in any proper sense of the word; or when you call the King, in the Prayer Book, a most religious and gracious sovereign, when he may be a great blackguard; or when you call yourself "your humble servant," when you are as proud as Lucifer.

10. Lies of modesty, when you say you cannot do what you can do, to avoid the appearance of forwardness.

11. Lies.

THEORIES ANCIENT AND MODERN UPON THE CAUSE OF EVIL.

In the religious consciousness of the race there is no problem which has laid hold of human thought and feeling with greater force than the problem of evil. It has been the ever-recurring spectre at the banquet of human thought. The most ancient philosophy that we know busied itself with this problem, and the latest also has this for its leading theme. It has been the minor strain of all the poets, and the tragic element in all the novelists. It has been the great enigma with which all religions have wrestled, and which moralists, theologians and philosophers face to-day. Certainly it cannot be uninteresting to consider briefly what solutions have been offered to explain this profound mystery of our existence.

In the nature-religions which indicate man's earliest thought, and where not moral but physical evil is the object of attention, the solution is found in the action of supersensible beings who are supposed to be the causes of all physical phenomena. The idea of second causes not being developed, all material operations are ascribed to divinities in them or back of them whose character is reflected in their work. These divinities are scarcely, in most instances, developed personalities, but spectres of the desert, titans, giants, half-human monsters, beings in the form of serpents and dragons, comparatively limited in power, and yet capable of many mischievous acts. They were only moderately feared, so that

after a calamity men went out to fight them, seeking by shooting their arrows in the air and uttering their warwhoops to frighten them. The act of the Indian medicine man, who, by dancing and beating his kettle, seeks to drive the evil spirits away, is a naive manifestation of this thought.

In the more pessimistic and highly developed religions this conception of the origin of evil takes on a more serious form. Here these malevolent beings assume a strong personification and stand as opponents of the good, often finding their head in a sovereign god of evil who stands over against the god of life and light as an equal or even stronger rival. This evil god goes forth to despoil the kingdom of the good, and inflict injuries upon men. As a consequence he and his emissaries are feared, which often leads to endeavors to gain his favor by propitiation and sacrifice. This is the origin of devil-worship, common especially among many of the African tribes. In other religions the antithesis between the two chief powers becomes more marked and developed. Here we have a dualism, such as we see in the beautiful sun-myth of Egypt, which represents Osiris, the god of life, as slain by Set, the Typhon, who brings on the Egyptians all the evils they most fear. In the German and Persian religions these conflicts are continued into the present age. However, in both there will be an ultimate triumph of the good—in the German religion by the destruction of the world and the arising of a new world in which peaceful gods will rule; and in the Persian by Arahmin being overcome at last by the Deliverer.

Another explanation for the origin of evil is that which attributes it to a fatality in the world. In Brahminism, for example, the free action of man is emphatically denied. We are ever being impelled by some antecedent necessity. Man "feels himself the toy of an unknown power." He is a part of the eternal whole and but one of the modes of its life. There is no such thing as evil in the world, as indeed there cannot be in any pantheistic scheme. All that man can do is free himself from his miseries by more complete unity with the divine. As individual life is extinguished evil ceases to be. In the poets of Greece we have an exhibition of the fatalism to which I refer. Homer makes even Jupiter himself bow before the inexorable law of fate.

Hesiod, in his poem on the ages of man, passes men through various periods in which they descend from happiness to extreme misery. There is no cause for this other than that it is in the order of things; a sheer necessity of fate. Buddhism also finds its explanation in the very nature of existence. It is the consummation of fatalism, making the very essence of conscious life to consist in suffering.

Somewhat similar to this view is that which locates evil in matter. This is the explanation of its origin given by ancient philosophy. Beginning with the Socratic school we find a dualism, not between two orders of gods, but between matter and spirit. Matter cannot be fully subdued to the workings of the divine reason, and in its resistance provides the necessary limitation, which is the ground of evil. All that is joined to matter is disfigured and corrupted, and this is es-

A Japanese merchant and two Korean coolies carry a whole store upon their backs and keep close up with the army.

pecially true of the soul as planted in an earthly body. Says Plato: "So long as we have the body with us the soul is coupled with this evil; we can never perfectly attain the goal of our desires; namely, truth." It is not necessary to follow this doctrine out as it was developed by Philo, the Gnostics and neo-Platonists of the first Christian centuries.

Another explanation given for the origin of evil makes it arise in a defect of deity, either of wisdom or goodness. The first idea is given in the legend of the Kamtschatkans, that evil came from the stupidity of the creator of the worlds who, but for the wiser counsels of his wife, would have perpetrated still greater follies.

The doctrine of Schopenhauer that evil arises from the irrationality of the will, which is the creative principle, is not much different. The second idea that evil results from a deficiency in the divine goodness, is a doctrine more than once suggested by the poets of Greece. Sophocles, in his tragedies, repeatedly expresses grave doubts as to the justice of the world. In the group of legends about Prometheus we are told the Titan is chained to the rock because he has sought to advance the conditions of men and give an impulse to a higher civilization. The race has also to suffer for the act by which Prometheus has made their advancement possible, for Pandora is sent to man with her box, from which, when Epimetheus opens it, there flies forth into the world all the evils which afflict mankind. Here we have the source of evil depicted as arising from a jealous god, who was opposed to human progress and advancement. The doctrine of predestination in Mohammedism is often stated in so bald a form that it really reduces to an imputation of the divine goodness. Says Omar: "Whom the Lord guideth, him none can mislead; and whom the Lord misleadeth, for him there is no guide."

Still another theory for the origin of evil, grounds it in human culpability. This idea has been presented in various forms. Thus some have located evil in a transgression of man against the deity at the beginning. This idea is found in various religions where the belief in the divine personality is held. The Persians had a second theory of the origin of evil along this line. The old Aryan conception was that Yima, the first man, living in beatic happiness in the paradise of Aieyana-Vaedja, committed a sin, the consequence of which burdens his descendants. In the Edda, Adhumea is beguiled by Loki with apples, into a wood, where she is suddenly carried off by a giant and happiness no longer abode in paradise. In Æschylus and Sophocles the misery of man is a result of the past; it comes as the consequence of some ancient curse which rests on the ancestors of the race. Thus in the ills that came upon the family of Agamemnon, the first link in the long unbroken chain of crime and catastrophe is the unnatural sin of Thyostes, the father of mankind. Indeed, we find again and again in Greek literature vengeance being visited on others because of the sins of ancestors, as the curse of Maule, in the "House of Seven Gables" follows the unlucky family of Pyncheon. The only explanation of evil given in the Old Testament is that which is here mentioned. Paul also sanctions the theory by teaching that Adam sinned and thus evil and death

came into the world by sin. The principle of solidarity, however, is not carried so far in the later prophets, in the book of Job and in the New Testament, as to overlook the element of individual responsibility. So also in Christian theology, the transgression of Adam gives the hereditary bias and impulse, but the real act of evil is the voluntary act of the free agent, choosing his own will in opposition to the Infinite Reason.

An entirely different conception from that just mentioned accounts for the origin of evil on the basis of a gradual deterioration of the race from a high condition to a savage state. Many mythologies start the race with a golden age, a time when men were supremely good and supremely happy, and then pass them through a series of subsequent ages, each worse than the preceding, until man reaches the bottom at last. Among the Aryan nations this conception was very fully developed. Men are to live for 12,000 divine years and pass through four epics—the age of perfection, the age of triple sacrifices, the age of doubt and the present age of perdition. In Hesiod we have the succession of gold, silver, brass and iron ages, in each of which there is greater deterioration. Zoroastrian mazdeism also has the universe continue 12,000 years and pass through four stages, in each of which man sinks in the scale of moral being.

A theory which we can only touch upon accounts for the existence of evil by asserting a misuse of freedom in some pre-existing state. This theory is found in a mythical form in the Indian doctrine of metempsychosis. It is also suggested in Plato. It appears in the religious speculations of the Jewish and Christian Alexandrians, and in the last century found an able advocate in Julius Mueller. In a more philosophic form it appears in the writings of Kant, Schilling and Schopenhauer.

The last theory we shall mention is that which makes evil the necessary opposite of goodness or a phase of finite limitation. Such theories have been numerous, and a mere reference to them must suffice. Spinoza said good and evil are merely subjective notions of reflection, evil being simply a defect of knowledge or insight. Leibnitz, in his "Theodicy," makes evil to consist in the metaphysical imperfection of man. As finite, man cannot be perfect; for finiteness signifies limitation in power and knowledge, and where this exists there will be error. Man will often, in the hurry of life, direct his attention to other than the true good. Kant also tells us that the creature is unable to realize his ideal life under the conditions of his present limitations. The only difference between good and evil is one of degree. The origin of evil is simply human inability or want of power. Hegel defines evil as "the adherence of the spirit to its naturalness," by which he means that, instead of making the universal good its goal, the soul looks to its own desires, greeds and passions. Thus we have many testimonies among the great thinkers of the world that evil is a consequence of human immaturity and finiteness.

The true explanation of the origin of evil would contain elements of several of these theories. It arises out of the conditions of our finite life. The self, with its hereditary impulses, is sensuous incite-

ments, its interaction with a historic community, in which the ideal of the good has not been realized, its limitations because of its lack of knowledge and experience, fails to regulate its conduct by the highest conception of the good, but constantly chooses particular ends agreeable to self, rather than those universal ends which express the rational and moral ideal. The particular will, limited to some desire of the self, is evil, for it is opposed to the Divine Will, which is the expression of the absolute good and the final moral order. When, then, the preacher states that selfishness is the source of sin, he has quite accurately hit the mark.

THE GERMAN EMPEROR WILLIAM'S ADDRESS TO HIS SONS ON PERSONAL CHRISTIANITY.—DELIVERED TO WILHELM AND OSCAR ON THE DAY OF THEIR CONFIRMATION.

My Dear Sons—At the present time, in which we are about to express our congratulations that you have joined us in the congregation of the Lord as men who have a fervid desire to work therein, I should like, as your father, to make a few remarks. This day, in a spiritual sense, is for you similar to the day on which the officer or the soldier takes the oath to his colors. As princes of the royal house you have the privilege of wearing a uniform from the tenth year of your age. To this I desire to compare your christening. You are selected as fighters for Christ. With the present day you have, so to speak, come of age in your faith. The defense and weapon, as well as the armor, which you will have to use, have been taught you and prepared for you by a skilled hand. Their use in all the situations of life is left to you from now on. But while in this respect it will be possible to also further instruct you, finally, however, everyone must learn for themselves how to use weapons. It is also the same with the spiritual ones which are entrusted to him. I intentionally speak in a military sense, as I presume you know the beautiful parable in which the Christian is compared to a warrior, in which the weapons which the Lord has placed at his disposal are left to his choice. You will certainly find later on an opportunity to use one or the other of those weapons; and you will surely carry out what you have this day so nicely promised in your pledge. Your religious teacher has emphasized—and quite correctly—to you the idea of what is to be expected from you; that is, that you must become "personalities." This is just the point on which, in my opinion, the most depends for a Christian in the struggle of life. For there can be do doubt whatever, when referring to the person of our Lord, we can say: He has been the "most personal personality" (*die personlichste Personlichkeit*) that has ever wandered about on this earth among the children of men.

In school you have read and heard and you will read and hear in the future, of many great men, savants, statesmen, kings, princes and also poets. You have read words and sayings of many of them, which ennobled you and even filled you

with enthusiasm. To be sure! Is there a German youth who would not feel inspired and enthusiastic by songs such as those of our poet Koerner? And yet they are all but the words of men. Not one of them is to be compared to any single word spoken by our Lord. And this is said to you so that you will be in a position to defend it as soon as you find yourselves in the struggle of life and hear exchanges of opinions and also exchange opinions yourselves regarding religion and, above all, regarding the person of our Savior. The word of a man has never been able to uniformly inspire people of all races and of all nations to attain the same aim, to endeavor to be like him and even to give their lives for him. This miracle can only be explained from the fact that the words he spoke were the words from the living God, which awaken life and which remain alive even after a period of many thousands of years, while the words of the savants are long forgotten.

Now, when I look back on my personal experience, I can only assure you, and your experience will be the same, that the cardinal and main object of human life, and principally that of a life full of responsibility and activity—this has become clearer to me from year to year—lies solely and alone in the position we take regarding our Lord and Savior. I have called him the most personal of personalities, and thus rightly, for it cannot be otherwise in human life; and as happens with us all, so it was also with him. There have been disputes regarding opinions of him; some were for him, some were in doubt, and many were against him. But about this there can be no doubt whatever, and the severest foe and denier of the Lord is but a proof of the fact—the Lord is still living at the present time as a complete personality which cannot be ignored! His heavenly form is still walking about in our midst, visible only to our mental eye and perceptible only to our soul; comforting, helping, strengthening, but also awakening contradiction and persecution, and because he cannot be ignored, every human being is compelled, whether he be aware of it or not, to compare the life he leads, the office he holds, the work he does, with the angle of vision in which he stands toward our Savior, and if his work is done in the sight of the Lord, whether it be agreeable to him, or whether it be to the contrary, his conscience, if it be still alive, will always thus direct him. In fact, I firmly believe that many people are of the opinion that it is inconceivable in our nowadays "modern" life, with its multifarious duties and its many situations full of responsibility, that one could give such particular attention to the personality of our Savior and have so much regard for him as there was felt for him in former times.

Mankind has filled heaven with many beautiful figures, others than that of our Lord, with pious Christians who are called saints, and to whom he prays for help. But all this is only an incident and vain. The only helper and redeemer is now, and will always be, the Savior. There is only one thing I can advise you with all my heart, regarding your future life—toil and work without intermission; this is the essential part of the Christian life; it was thus he lived before us! Glance at the scriptures and read the parables of

our Savior. The severest punishment is for the one who does nothing, who sits idle or floats with the stream and allows others to do the work, such as in the parable of the talents. Whatsoever be your passions or your gifts, everyone should try to do the best in his power and in his province to become a personality, to grow into his duties, to toil in them and to further them in accordance with the example of our Savior. Above all, in everything you commence, strive to make it, if possible, of benefit to your fellow men, for it is the most beautiful thing to rejoice with others, and where this be not possible, try to have your work of at least some help to your fellow men, as was exemplified in the life full of work and the acts of our Lord. In so doing then you will have fulfilled what is expected from you. Then you will become good German men, capable princes of my house, who are able to share in the great work left to us all. That you may be fitted to carry out such a work to its accomplishment with blessings, and that the help of God and our Savior be with you in this task will ever be our prayer.

BOOK V

Newest Discoveries

IN THE

SECRETS OF HEALTH AND LONG LIFE

WITH THE

Scientific Formulas and Principles for Physical and Mental Strength

SCIENTIFIC EXPLANATION AND DIRECTIONS IN PREVENTION AND CURE OF DISEASE WITH THE SPECIAL METHODS OF CONTINUED HEALTH AND LIFE FROM THE GREATEST LIVING AUTHORITIES

Cave dwellers of the present time. In the centre of the floor was the usual native hearth of three stones, with the fire in the centre, but there was no cooking pot on it; instead, suspended from a tripod, an earthen crock, which contained food, was simmering over the flame. Suspended from some rough poles across the rocky ceiling were numerous little packets of herbs, skins, dried meat, and other commodities which had to be placed in safety from the rats scuttling about in the remoter recesses of the cave.—MAJOR POWELL-CLAYTON'S ACCOUNT.

NEWEST DISCOVERIES IN THE SECRETS OF HEALTH

THE GOSPEL OF HEALTH.

As we look out upon the animal kingdom, to which we are so nearly related, and learn their habits and conditions of life, especially of those which have not been developed awry, and more or less perverted by long association with mankind, two salient facts appear. In the first place they are all healthy and vigorous, and without imperfections or blemishes, and, in the second place, the minimum of longevity among them appears to be a period four times as great as that required to bring them to maturity. Furthermore, they all seek exactly the nourishment necessary to their growth, and never take more than the requisite amount. Nor are they ever known voluntarily to partake of anything in the nature of stimulants or poisons, so craved and indulged in by almost all the races of men, and so debasing and destructive in their effects. It is evident that mankind in crossing the line from where they were guided by an unerring instinct in these matters, and entering upon the dignity of humanity, by the possession of which they became endowed with the power of choice between good and evil, made in respect of their physical well being a great sacrifice. Had that side of man's nature remained in the domain of instinct we should have every individual not only healthy, but beautiful, for that is what the ideal nature, unhindered, strives for in all cases and attains, and we should have the average of life prolonged, hearty and enjoyable, to at least a hundred years.

Compare these ideal and altogether possible conditions with those we find existing to-day. Perfectly healthy individuals are almost unknown, and perfectly beautiful ones so rare that they are sung and celebrated wherever they appear. Look about in the cars and crowded streets, or in assemblies or drawing rooms, and how often will be found a man or woman with the radiant glow of perfect health, or who has not wrong proportions, some awkwardness, or some imperfection of line or feature about them. Probably the Greeks attained the highest degree of physical perfection as a race which has ever been reached. They cultivated and trained the body, their life was largely out of doors, and their way of living simple and abstemious.

The ancients made Health a goddess, and it were well had her worship never failed and her altar fires girdled the earth to-day. Were she regnant now, there would be a joy and zest to life which no stimulants, and no toxic agents, can impart, and there would be a relish for work and play and a soundness of morals and vigor of mentality which can never be associated with impaired and debased physical conditions of the human body. We are just beginning to realize

that in the task appointed us of lifting humanity up to a higher level we have begun at the wrong end. We have been lashing our intellectual faculties and prodding our moral natures, while not only wholly neglecting, but generally abusing, our physical selves, the well-being and healthiness of which are a fundamental necessity for any sort of progress.

A large number of scientific medical men have in the past two or three decades entered upon a careful study of existing conditions, with a view to the ascertainment of the causes of so much that is deplorable and discouraging, and to find some remedy. They have reached a wonderfully unanimous consensus of opinion, and it is that the whole human race is being gradually deteriorated and debased by the voluntary and greatly increasing use of various poisons, alcohol, tobacco, opium and other drugs, and the toxic effects of improper and excessive amounts of food are said to be the causes of not only nine-tenths of the diseases which affect humanity, but of most of the crime and poverty as well. It is a common thing to hear a man warned of excesses say, "I had rather have a shorter life, and enjoy it without restriction, than to be abstemious and live to be old." Even if every man were not bound to make the best of himself, he has no right to handicap his offspring, and that is just what is being done to an extent that is alarming. Heredity is inexorable, and it is through it that the sins of the fathers are visited upon the children to the third and fourth generations, and that the world is coming to be full of decadents. The child inherits the parent's propensities in increased degree, the cells are weakened and evil mental traits and feeble moral and intellectual tendencies and abnormal habits appear. Look at a few facts: Dr. Depierris says in his book, recently published, that tobacco is destroying the French race in the cradle, seventy per cent of the children in cities dying in their first year, the cause being that their vigor is withered in the sources of life by the excessive use of tobacco by their fathers. Statistics show that the consumption of alcoholic beverages has increased in the United States from ten gallons per capita in 1880 to nineteen gallons in 1902, and a corresponding increase of crime and insanity has gone along with it. The annual cost is $1,000,000,000, while all public education costs only $175,000,000. Bring this waste to an end, with its attendant evils, and the worst problems of poverty and crime would disappear. The need of the hour is to proclaim a gospel of health. There will be no sound minds, no moral healthy tendencies and propensities, without sound bodies, and there can be no sound bodies until narcotic and alcoholic poisoning ceases.

Educational methods should be reformed, and careful scientific hygiene and physiology taught, and re-taught throughout the courses of all schools and colleges. Nine-tenths of our people are physically defective, and our first aim in education should be to send every boy and girl into life with sound, normal, healthy, well-developed bodies, without the craving for any poisons. With that accomplished, one will hardly go amiss in saying the morals will look out for themselves.

SLEEP.

Now blessings light on him that first invented this same sleep. It covers a man all over, thoughts and all, like a cloak; it is meat for the hungry, drink for the thirsty, heat for the cold, and cold for the hot. It is the current coin that purchases all the pleasures of the world cheap, and the balance that sets the king and the shepherd, the fool and the wise man, even.—*Sancho Panza.*

Of first importance to physical and mental health is plenty of sound, peaceful sleep—sleep, "sore labor's bath, balm of hurt minds, great nature's second course, chief nourisher in life's feast." Especially essential is abundant sleep to mental vigor and well being. The tired leg, the tired arm, can relax and rest any time. The heart, which seems never to pause, really ceases momentarily from its exertions after every beat. The brain never completely rests except in sleep. He who takes less sleep than nature demands, no matter from what cause, invites mental impairment. Protracted loss of sleep means nervous derangement, insanity, death.

Many people find it hard to go to sleep. This is because too much blood stays in their brains. When the mind is active the brain is ruddy and full of blood. In sleep it is pale and bloodless. The remedy for insomnia is the expulsion of the blood from the brain. This may often be secured by lying in a restful position and doing one's best to think of nothing, or by keeping the mind fixed upon some totally uninteresting subject. A light, digestible meal, eaten shortly before retiring, will sometimes draw the blood from the brain to the stomach and induce sleep. Hot applications to the extremities will in many cases bring it. But the best cure for insomnia is daily exercise, careful dieting, and a care free mind. "Where care lodges sleep will never lie."

Sick people need more sleep than well ones. Women usually require more than men. Children and the aged must have more than persons in their prime. Napoleon slept only three or four hours a night while fighting some of his great campaigns.

Few people can keep in the best bodily and mental condition on less than seven hours' sleep; most need eight, many nine.

THE VALUE OF SOUND SLEEP AND HOW TO OBTAIN IT.

The two material conditions that particularly contribute toward sound and refreshing sleep are proper ventilation and proper lighting of sleeping apartments. Most people of intelligence now sleep with a window open the year around. But one window is not enough. It should at least be lowered from the top and raised from the bottom, as two apertures are essential, one for the ingress of pure air and the other for the egress of polluted air.

To procure perfect circulation, however, and a change of air as rapid as is the exhalation from the sleeper's lungs, two windows should be open, one on each side of the room, or the second one may be in an adjoining room. To prove the need of this let a person who has been out in the open air walk into your house

and enter your bedroom before you have risen in the morning. If you have been going on the one-window ventilation plan, his nostrils will promptly detect it, and he can tell you what you yourself will not be able to discern—that your room is close and ill smelling. Try the two-window plan, and your visitor will be able to report your surroundings fresh and sweet smelling.

VENTILATION AND LIGHT.

But many of us who have learned the lesson of proper ventilation have given the subject of lighting no thought. Just as surely as you cannot sleep properly in air that poisons the blood, you cannot sleep properly facing the light. It irritates the entire nervous system, and nerve energy is too precious to be parted with unnecessarily. The result is that the sleep is not deep and undisturbed, and nature is proportionately hampered in her repair work. This happens in a harmful degree even though you may not realize it sufficiently to awaken. And it happens, of course, when the gray dawn comes stealing through your window in your last hour or two of sleep, the very time when the brain should be getting its best rest and upbuilding. You may receive the effect in a headache the next day, or you may get it in impaired digestion. For even digestion depends upon sleep. If the cells that are concerned in the stomach operations are not built up, they cannot work properly.

Now the remedy for this lies in the arrangement of your sleeping room. Do not, for your very health's sake, try to correct it by darkening the window with curtains, for that shuts out the life-giving fresh air. Let your windows alone. But simply turn the bed about so that you do not face the light. If there is no other way to compass the purpose, it can be done by placing the head-board of the bed against the window. And this will serve a double object in that it will also act as a protection against the draught. If it is a modern brass bed without the head-board, hang a blanket or quilt over the top railing. Quite possibly some one may remark that the room will not look so well. Perhaps it will not. But life is more important. And just remember that it is the prolongation of human life that you are aiming at through the right conditions for sleep, proper lighting and proper ventilation. Some day when architects learn to build houses for the accommodation of people instead of, as now, forcing people to accommodate themselves to houses, all of these emergencies that befall in the natural course of living will be arranged for. Until then we must make the best of present circumstances.

But, there is another occasion where we are gravely, sinfully delinquent, that is, in the matter of letting the light shine in a sleeper's eyes. We cannot lay the blame to the architects nor anywhere else but to our own carelessness. And, worst of all, little children are the helpless victims. How often is a baby allowed to lie flat on its back in a cradle or a carriage with its face lifted to a glare of light? It is worse than it could possibly be for an adult, for he will know enough to turn over or otherwise shield his eyes with the bed coverings. It is a wrong, a

great wrong. The light not only interferes with the baby's sound sleep, but it in many cases directly affects the optic nerves and impairs the organ of sight. And so we have many little children wearing glasses.

CLEANLINESS AND DISINFECTION.

Disinfection is only efficient when complete; like antisepsis, it is valueless if any detail of technic be omitted. If death occur in a case of virulently contagious disease, the room is generally disinfected; but attendants and body are often allowed to escape. This is a flaw in the method which makes it a question whether any actual good has been done. To make matters actually safe, it is wise to insist upon thorough disinfection of the room, of the body, of the attendants, and their clothing; and though the patient be living of the body also.

Clothing is best disinfected by immersing in water in the room; it may then be safely carried to wherever it is most convenient to boil, steam or treat by chemical disinfectants. Carbolic acid is perhaps the best and cheapest all round disinfectant. The room cannot be satisfactorily disinfected while occupied with a living patient. If the patient can be moved, the room may be disinfected, and the patient returned. Otherwise it is advisable to await recovery or death. After the completion of the case, all our readers know the proper use of sulphur and formaldehyde, of carbolic acid, and corrosive sublimate.

Disinfection of the living patient and of the attendants is quite important. An infected patient is disinfected by a bath of corrosive sublimate or carbolic acid, and a complete change of clothes and bedding. Corrosive sublimate is only to be employed where a porcelain-lined bathtub is available. The disinfection of the patient improves his comfort and safety, and it protects, in a measure, those who attend him. After the first thorough bath and disinfection, it is often advisible to employ antiseptic sponging at frequent intervals. If an exposed person will submit to such treatment, and don a complete change of clothing, he may be released from quarantine, but should be kept under supervision. Naturally he must remain away from the possibility of reinfection until the known period of incubation is passed safely.

AIR A TONIC AND "SOAP."

At first sight there may not seem to be any question about it—the way to use air. But on the most casual examination it appears that you can use air only a little or you can use it a great deal; also that you can use it clean or use it dirty.

People would not dream of drinking water that they suspected to be dirty, but they cheerfully swallow any amount of dirty air.

Again, they would not use the towel hanging by a public washbasin in a train lavatory because it has been used by other people, but, seated in the train, they will

use air that has been used by all the other travelers, and not used once but used often.

The moment one frankly investigates one of these little details of existence someone cries: "Oh, don't; it's too horrid!" Yet it would be interesting to compute how often the same air has passed through the lungs or parts of the lungs, rather, of all the many people sitting in a car with the windows closed for half an hour. There is no need to say a great deal about oxygen and carbonic acid gas —we may leave that to the science primer which everybody studies at school and forgets, presumably, the minute they leave school; but some reference may be made to the fact, and that "close" air and "hot" air are not at all the same thing.

Air may be close and hot—that is the more frequent state in which one finds it, but it may also be close and cold—as, for instance, in public halls, when one goes into them before an entertainment, and in empty school-rooms, and also in empty railway carriages.

By breathing very quietly and deeply, by being well nourished, one can avoid "catching cold" from sitting beside open railway carriage windows; but sitting in close air it is very difficult, in fact, almost always impossible, to avoid suffering in a variety of ways from the poison (we will call it broadly poison, as a matter of fact it is chiefly carbonic acid gas) of close air.

The person who is really strong and really healthy is the person who keeps fit in bad conditions.

Air is the finest preservative of temper. Irritation, that insidious modern disease from which so many people suffer without knowing it, and "nerves," that is "overstrained" nerves, is a state which, once you are alive to the fact, you can actually see being produced in people owing to close air, and especially working in close air.

The snappishness and "shortness" so often to be found in business offices are not to be wondered at when one gazes round the room and notices the shut windows, nearly all of them dust sealed.

When you have learned to notice this unhealthy, nervous condition—it is to be found in the chambers of invalids, too—in other people you can watch carefully, and note the similar effect of close air on yourself!

METHOD OF INHALATION.

Stand a moment or two at an open window and draw four or five deep, long breaths; when you return to the conversation you were holding or the work you were doing, self-command will be quite easy; you won't feel rasped up.

There has recently been some public correspondence about the efficacy of breathing in time to the motion of the vessel as a preventive of sea-sickness. It is not the fact that one breathes in time with the rise and fall of the steamer which sobers the irritable gastric nerve, but the fact that one breathes slowly, and hence deeply and fully, and that stills every nerve and induces a feeling of power and control in the system.

This may be experimented with in various ways, this special use of air.

There are persons who feel sea-sick when the vessel is still in harbor and quite motionless; let them try deep and full breathing (not in the stuffy cabins, but

somewhere where the air is "fresh"), and they will be delighted by the result.

Again, suppose you have before you an interview, say, with a servant whom it is your unpleasant duty to reprimand or dismiss; most sensitive and kindly-natured women hate this occasion and suffer considerably just beforehand.

Try the deep, full breathing (at the hall-door or a good open upper window) for a few moments first; you will experience just that sense of calmness and self-command that is so essential, your pulse will be steady, your voice low and clear, your nerves absolutely in order—simply and solely from a right use of that most common element, the air.

BATHING IN AIR.

Air, you may not have happened to know, is also an excellent medium to wash with. Some people prefer it greatly to water, and there is a good deal to be said for them.

Most of us believe in "airing" linen that comes home from the laundry, but it is vastly more necessary to air that sort of clothing which, from its texture and make-up, cannot go to the laundry.

A good maid makes this a regular part of her duties, but people who live in the country could go a step further and have things hung in the sun in some private part of garden or grounds; anything would be better than the very general habit of piling linen upon a chair at night—in rooms in which one is about to sleep.

Air and sunlight have a wonderful effect upon the hair in strengthening it and keeping the skin of the head healthy, and moist air upon a "drizzling" day or warm springtime is astonishing in its effect upon the complexion.

Air baths are becoming very general.

When Kneipp cures and Keigren cures have been so much heard of, the larger public is waking up to the idea that some of these means to health may be inexpensively applied at home, and it is certain that cold-catching becomes a thing of the past with those women who make a practice of washing freely indoors in the fresh air.

All physical exercises gain in effect by being performed with little clothing on the body. The small nerves of the skin experience a restraint, which communicates itself subtly to the muscles, from heavy garments worn during morning exercises.

Take an air bath, in full sunlight, in a room where one is protected from winds. Under other conditions you lose a certain amount of heat. It is, in so far, a bad thing to lose heat, that if the temperature of the body sinks below a certain point, the capabilities of the muscles are at once restricted and impaired—witness the clumsiness with which you tie a bow when your fingers are cold.

Every scientific theory tends to insist on the possession of power, alertness and perfect control of the whole of one's muscles and nerves, so that the air bath should not be taken in a state of repose, except in such weather and conditions as will not tend to chill the skin; but an air bath combined with exercises of five minutes' duration will be a splendid stimulant, and it has this advantage—that one can see the muscles at work, and have the satisfaction of watching them grow. For an air bath is a light bath, too, and no

small part of its use is the satisfaction of the mind in watching increasing symmetry and grace of movement.

AN ESSENTIAL METHOD OF BREATHING TO RETAIN HEALTH.

A great deal is being written and taught concerning the vital importance of correct breathing in the cult of health and beauty. In every public school the pupils are being taught correct or deep breathing, and it is impossible to estimate the lives that will be prolonged and saved, as well as the enjoyment of life, the beautifying of faces and the development of symmetrical figures that will certainly follow the knowledge and application of the rules for deep breathing and the distribution of the oxygen inhaled in all parts of the lungs.

The Hindus describe many forms of correct breathing. They preach the gospel of the breath of life and lay enormous stress on the importance of the proper performance of this essential function. The complete breath is an exercise everyone should practice. It is described as follows:

1. Stand or sit erect. Breathing through the nostrils, inhale steadily, first filling the lower part of the lungs, which is accomplished by bringing into play the diaphragm, which descending exerts a gentle pressure on the abdominal organs, pushing forward the front walls of the abdomen. Then fill the middle part of the lungs, pushing out the lower ribs, breast bone and chest. Then fill the higher portion of the lungs, protruding the upper chest, thus lifting the chest, including the upper six or seven pairs of ribs. In the final movement the lower part of the abdomen will be slightly drawn in, which movement gives the lungs a support and also helps to fill the highest part of the lungs.

At first reading it may appear that this breath consists of three distinct movements. This, however, is not the correct idea. The inhalation is continuous, the entire chest cavity from the lowest diaphragm to the highest point of the chest in the region of the collarbone being expanded with a uniform movement. Avoid a jerky series of inhalations, and strive to attain a steady continuous action.

WATER AS THE BEST MEDICINE.

Drink a glass of water when you get out of bed in the morning. Never mind the size of the glass. Let the water be cold if you will. Some people prescribe hot water, but that isn't necessary.

You may have washed your face already and relished the experience. You may have taken a cold plunge into the tub and delighted in the shock and its reaction. The brisk use of the tooth brush has left your mouth clean and the breath sweet. But you are dirty still. Drink a glass of cold water and enjoy the sensation of being clean inside.

All that is luxurious in the cold bath cleansing the outside, is artificial. That which should prompt the glass of water after sleeping is natural. As a test, tell the 9-year-old protestant against his morning scrub of cold water that he may escape it by drinking half a pint of the fluid. He will jump at the opportunity.

Sleep has drawn upon the water in the blood, and the instinct of the animal, under natural conditions, is to replenish the circulatory system and distend the blood vessels anew. The food in the stomach which had so much to do toward inducing sleep has disappeared, leaving a mucous substance in the alimentary canals. Yet man would wash his face and leave these half-clogged canals to the duties of another day.

Drink a glass of cold water in the name of cleanliness. It becomes one of the shortest and easiest of toilet duties. It is swallowed in a second and in five minutes it has passed from the stomach, taking with it the clogging secretions of the alimentary tracts. It has left behind the stimulus that goes with cold water, and, by filling the arterial system to the normal, it puts a spur to the circulation that has grown sluggish in the night. It is one of the greatest of awakeners and one of nature's own stimulants.

Drink a glass of water before breakfast, another before luncheon, and another before dinner. Water is the best, cheapest and pleasantest medicine.

HOW MUCH TO EAT.

How shall one determine how much food to eat? Let your sensation decide. It must be kept in mind that the entire function of digestion and assimilation is carried on without conscious supervision or concurrence. It should be entirely unfelt and unknown, excepting by the feeling which accompanies and follows its normal accomplishment.

Satiety is bad. It implies a sensation of fulness in the region of the stomach, and that means that too much food has been taken. The exact correspondence, in a healthy animal, between the appetite and the amount of food required is extraordinary.

As a rule, the meal, unless eaten very slowly, should cease before the appetite is entirely satisfied, because a little time is required for the outlying organs and tissues to feel the effects of the food that has been ingested. If too little has been taken, it is easy enough to make it up at the next meal, and the appetite will be only the better, and the food more grateful.

No one was ever sorry for having involuntarily eaten too little, while millions every day repent having eaten too much. It has been said that the great lesson homœopathy taught the world was this: That, whereas physicians have been in the habit of giving the patient the largest dose he can stand, they have been led to see that their purpose was better subserved by giving him the smallest dose that would produce the desired effect. And so it is with food.

FOOD NEVER SHOULD BE BOLTED.

Many serious maladies are due to bolting food. This bad habit not only leads to difficulty of digestion, but it favors excessive eating. Each morsel of food should be chewed until its flavor is no longer perceptible, when it will be almost automatically swallowed and digested quickly and comfortably.

The morbid craving for food, which is a common symptom, is often dispelled by leisurely and elaborate mastication. A small quantity of food well masticated will satisfy the appetite and the requirements of the system much more readily than a large quantity that has been bolted.

SCIENTIFIC CONCLUSIONS AS TO SMOKING TOBACCO.

It certainly is a peculiar item in the history of mankind that since the fifteenth century a vegetable growth (Nicotiana Tabacum) has come into such general use for smoking as almost to revolutionize the social customs of civilized people. It would be difficult today to find a quarter of the globe in which this use of the plant is not known; yet, although now so prevalent a habit, smoking has met with stout opposition at times.

It has been denounced by popes, from pulpits and on platforms; even reigning sovereigns have set themselves to stamp out the practice. Russia at one time insisted on cutting off the nose of every smoker; and Persia once made it an offense punishable by death. It has been proclaimed against on the Continent in almost every part; and in England King James I.'s "Counterblast Against Tobacco" is a lasting memorial of his determination that "no puffer of tobacco" should receive any Crown appointment.

It has been contended, on the one hand, that tobacco is a poison and every smoker a suicide; while, on the other, it has been claimed as an aid to longevity, so minimizing the wear and tear of life that old age naturally ensues. In spite of all opposition and of every argument raised against it, the use of the soothing weed is a well-nigh universal custom.

That tobacco is not a necessity is readily conceded on all sides, for no sane person could possibly claim that its use is essential to life. Its most devoted friends plead nothing beyond the fact that smoking is a luxury, one which sustains a cheerful brightness and affords an enjoyment out of all proportion to the smallness of its cost. Complaints against the extravagance of the habit are unreasonable, and only to be attributed to wilful ignorance or want of reflection. Many things in daily use are by no means necessary, yet they largely contribute to the enjoyment and pleasure of life.

Thackeray once said: "I vow and believe that the cigar has been one of the greatest creature comforts of my life—a kind companion, a gentle stimulant, an amiable anodyne, a cementer of friendship. May I die if I abuse that kindly weed which has given me so much pleasure."

TOBACCO AS A POISON.

The only objection really worth consideration is that tobacco acts as a poison in the healthy system. On this score a great deal has been put forth which is matter for serious reflection; but other allegations have failed to discriminate between the use and the abuse of the weed. It is easy to find similar fault with most things we eat and drink, for more harm has resulted from lack of self-control in

An allegory of war represented by the Chinese God of pestilence and destruction.

ese matters than could possibly follow ..e excessive use of tobacco.

Indeed, there is nothing which, though lawful and right in itself, is not open to the same kind of abuse; and if we deprive ourselves of everything capable of being wrongly used, away go money, food and life.

As already suggested, the main point for consideration is the poisonous action of "Nicotiana Tabacum." Medical science has proved that tobacco used in excess has a directly harmful influence on the healthy system. But, then, the same may be said of opium, strychnia and belladonna, three of the most useful drugs of vegetable growth, yet, nevertheless, three of the most actively poisonous. They have a legitimate use, and thousands of persons are frequently deriving benefit from taking them; their action as poisons is only produced when they enter the system in too large a dose. Would it not be unreasonable to prohibit their use as medicines, simply on the ground that they are open to abuse as poisons?

EXCESSIVE SMOKING.

The two common conditions which result from excessive smoking are a characteristic alteration of rhythm in the beating of the heart and an affection of the eyes which impairs the vision and reduces the power of distinguishing colors. The furred tongue, the chronic irritation of the throat, and the accompanying dyspepsia, though less important, are, nevertheless, inconvenient and ought never to be present in a healthy person.

That such harm does result when use passes into abuse is sufficient warning to put every smoker on his guard; and, if an occasion arises, should prompt him to reduce his consumption of tobacco, or lay aside forever a habit which threatens to impair his health.

The opponents of smoking unfortunately rely upon evidence gathered from these cases of abuse, and the consequence is their allegations do not accord with established fact. If every smoker were being slowly poisoned deaths would occur at an earlier age, and their number would markedly increase. There are many things besides tobacco which are highly detrimental when abused, yet the rational use of them is beneficial in the highest degree.

The late Professor Huxley said: "There is no more harm in a pipe than there is in a cup of tea. You may poison yourself by drinking too much tea, or kill yourself by eating too many beefsteaks."

Dr. Richardson says: "In an adult man who is tolerant of tobacco, moderate smoking does no great harm. It somewhat stops waste and soothes. The ground on which tobacco holds so firm a footing is that of nearly every luxury —it is the least injurious."

Dr. Lankester said: "I dare not, as a physiologist or a statist, tell you there exists any proof of its injurious influence when used in moderation. The first symptoms of giddiness, or palpitation, of indolence, or uneasiness while smoking should induce you to lay it aside. These are physiological indications of its disagreement, which, if you neglect, you may find increase upon you and seriously embarrass your health."

It should not be forgotten that some constitutions are altogether intolerant of

tobacco, even when it is smoked to a limited extent, and for such persons there is but one sensible course, and that is to give it up.

Those who are rational smokers will never indulge on an empty stomach; many seem able to do so with impunity, but the practice is bad. They will keep the pipe well cleansed, and use only a pure tobacco. Whether smoking a cigar, pipe or cigarette, they will abstain from using it to the last extremity, because it is the accumulated products of combustion which form the injurious elements. The rational smoker will never expectorate unless on occasion when absolutely compelled; or, if he finds himself falling into this bad habit, being rational, he will cease to be a smoker.

TOBACCO AND THE YOUNG.

There is no physician who will not condemn the use of tobacco by juveniles. He knows, as the result of exact knowledge, the effects of tobacco on the youthful system. The unfortunate part of the matter is that the doctor here resembles one crying in the wilderness, no man heeding his warnings. It is, however, a cheering sign of the times that public attention is being fortunately directed to this evil. Once we can arouse public opinion regarding the effects which tobacco-smoking is capable of producing on the young, we shall have taken the best and the most effective step towards the repression of the habit by legal or other means.

EFFECT ON CHILDREN.

To understand the injurious effects of tobacco on the juvenile system, we require to have regard to the exact composition of the blood. It is a matter of common knowledge that any alteration of the quality of the blood is a serious matter at any age. We see this fact illustrated in the case of an anæmic girl, where her symptoms and weakness are known to be due to a lack of proper composition of the vital fluid. The blood, let us remember, is the common currency of the body. All nutrition is effected through its aid. Every tissue and every cell draws its store of nourishment from the blood; hence, if any deficiency exists in the quality of this fluid, the nourishment of the body cannot proceed as it should do. Especially serious is this in the case of the young. There the body has not merely to make good its daily loss, but it has also to account for growth. The deficient quality of the blood is therefore a far more serious matter in early life than in later existence. If the growing tissues are not supplied with the material from which they are to form the new growths needed for the body's building, stunting of the frame must inevitably occur, to say nothing of other results dependent upon this cause.

INJURY TO THE BLOOD.

In our blood we find untold millions of microscopic bodies called red corpuscles. These give the blood its red tint. They float in the liquid, or serum, of the blood, which liquid is as clear as the water we drink. The use of the red corpuscles is to carry the gases of the blood. They convey to all parts of the body the oxygen we breathe into our lungs from the air. This oxygen is part of our food, and without it no other food can be utilized in the body; while when we are deprived of

it, as we all know, life ends in a few minutes at most. These red corpuscles also carry back to the lungs the carbonic acid gas which represents part of the waste of our bodies, and which is continually being given forth as the result of our bodily work. Anything which, therefore, interferes with the action of the red corpuscles of the blood must result in two things. First, we cannot have conveyed to our bodies a sufficient supply of oxygen; and, second, we cannot have removed from our bodies the waste which for health it is necessary to be rid of.

INJURY TO HEART, EYES AND STOMACH.

Excess of tobacco in the adult will produce very definite results. A man who over-smokes will suffer from eye-troubles and from heart affection. His digestion will also be upset, and his health will suffer at large. When he gives up the excess-habit his normal state will be represented. His eyes will regain their powers, and his irregularity of heart action will cease. He will be all the better if a good tonic is used, twice daily after food, or a teaspoonful of the compound syrup of the hypophosphites thrice daily in water after meals. So far the adult can easily recover his health in most cases, tobacco being given up till he is well, and strict moderation being afterwards observed. Tobacco-illness is most frequently seen in cigarette smokers, who are apt to consume much more of the "weed" than pipe or cigar smokers. The cigarette is an insidious form of tobacco-indulgence, seeing that it is always ready at hand and that it is regarded as representing a mere "whiff" and nothing more. This is a mistake and in addition we get the baneful habit of inhaling the smoke, which, as a medical journal lately pointed out, contains very noxious elements indeed.

EFFECT ON GROWING BODY.

In the case of the boy, results are of a very different and more serious nature. He is affecting a growing body, and one whose nutrition has yet to be fully accomplished. Tobacco on the young acts specifically on those red corpuscles of the blood to which allusion has been made. It destroys their power of discharging their duties. They cannot perfectly carry oxygen to the body, or remove carbonic acid gas and other waste matters from it. Hence the health of the boy is really attacked from two directions; one from the side of his adequate nourishment, the other from the side of the removal of waste. Tobacco-smoking under adult age therefore results in a tendency to the under-nourishment of the body, and to stunting of growth. In addition we have to take into account its effects on the heart and eyes, which cannot be less serious than those seen in the adult. In a word, tobacco is a poison to the young, and if we object to the young taking alcohol, so likewise should we strenuously oppose their indulging in tobacco. The law or sentiment which forbids juvenile drinking should be extended to the prevention of juvenile smoking.

WHISKY AS A MEDICINE.

A noted physician was once asked by a noted patient recovering from a severe and exhausting illness whether whisky would accelerate the process of recovery, which was discouragingly slow. The patient had once been what is known as a "hard drinker" and had stopped the use of liquor altogether. The question was, would it be wise to put the enemy into his mouth again even under exigent circumstances?

The physician said: "The moral phase of the case need not be considered at all. We are dealing with a medical proposition. I assure you, as a physician and as a man, that the use of alcohol is unnecessary. There is nothing that alcohol will do that cannot better be accomplished by strychnine and without any of the evils, actual and contingent, which follow the use of whisky."

The patient got well, thus justifying the advice of the physician, and the opinion of that physician is now held by most medical men. While it is doubtless true that what is one man's meat is another man's poison, there never was a time when physicians were more slow to prescribe alcohol in any form than they are today. The net result of this medical attitude is that we shall have less humbug and hypocrisy about whisky as a "medicine." People who want to drink it will do so avowedly as a beverage and that will be just as satisfactory. Whisky as a beverage will stimulate one as surely as if it were a medicine, and as intoxication, to a greater or less degree, is the object sought by him who drinks whisky, the chief end will be attained just the same.

CONSUMPTION AND ALCOHOL.

Dr. Davis in his book on Self-cure for Consumption, says, "Nothing brings the patient more quickly and surely to the grave than alcohol. Alcohol has never cured and never will cure tuberculosis. It not only poisons the system, but it ruins the stomach, and thus prevents this organ from properly digesting the necessary food. It impairs nutrition, the very function which, of all others, it is important in consumptives to maintain in its highest integrity. The elimination of alcohol by the lungs increasing the congestion of the bronchial mucous membranes, and thus enhancing the cough, is very objectionable. The digestion is impaired as well as the heart's action through fatty degeneration, and other functional and pathologic conditions are produced or intensified. One of the most important offices of breathing is to remove from the blood the carbonic acid gas, while drinking alcohol retains it. The more a man drinks the less carbonic acid gas is carried out of the system by the expired air; it must, therefore, be retarded, and must accumulate, rendering the blood more and more impure."

TEMPERANCE AND LIFE INSURANCE.

It is a curious fact that the prohibition movement in England was first organized through the refusal in 1840 of a life insurance company to accept a total abstainer at its ordinary advertised rates.

The medical advisers of the company

held that the total abstention not only subjected its professor to unusual risks of infection but also implied such a peculiar character, so different from that of the average man on which their statistics were based, that these could not be relied upon in determining the risk.

This man was Robert Warner, a bell founder of London. He was 26 years of age, a total abstainer, and a Quaker. He immediately set about forming an insurance company of his own, and with the assistance of other total abstainers and members of the Society of Friends soon succeeded in establishing the United Kingdom Total Abstainers' Life Association, in which Warner took out the first policy.

ABSTAINERS LIVE LONGEST.

In 1849 a new department was added to the company, to which non-abstaining members were admitted. However, only those who used alcohol in such moderation that no lesion from its use could be detected at the time were admitted. The name of the society was changed to the United Kingdom Temperance and General Provident Institution. From 1866 to 1901 the statistics of each section were kept separately.

During this thirty-six years, in the moderate drinking division there occurred 11,241 deaths with claims amounting to $12,999,635. In the temperance division there were 6,300 deaths, with claims of $7,243,110. According to calculations based on the probability figures of the institute of actuaries, there should have occurred 11,727 and 8,838 deaths respectively. The deaths among the moderate drinkers were 486 less than was to have been expected, while those among the total abstainers were 2,538 less, a striking difference in favor of the prohibitionists.

INSURANCE PREMIUM LOW.

According to Dr. J. Simms Woodhead, a prominent English physician, the position of English companies is now exactly reversed, and they are glad to pay a ten per cent bonus to total abstainers.

During the last year there has been an unusual amount of discussion by leading physicians in England and France of the value of alcohol as a drug and its dangers as a beverage. There has thus been put on record a mass of new testimony of the highest scientific character, and entirely free from the prejudice which stultifies so much of the pure prohibitionist literature. The conclusions justified by the experience of the majority of these men may be briefly summed up as follows:

ALCOHOL IS A DRUG.

In certain bodily conditions and when carefully administered, alcohol is a valuable drug, but is at present used much too freely, and with distinctly harmful results. Its use as a daily beverage in any form is dangerous, physically and morally. As an illustration of its medicinal abuse, Sir Samuel Wilkes cites the following case:

"A young lady for many years the subject of heart disease had finally been forced to take to her bed, and Dr. Wilkes was called in consultation. It was a matter of formality, as she was thought to be dying.

"She was lying in bed gasping, with a fluttering heart and an almost imperceptible, irregular pulse, and semi-conscious; she was being plied with brandy in order to keep her alive. The two medical men

who were present did not perceive that they were poisoning her, but nevertheless assented to my strong wish to stop the spirit. I met her a short time afterward walking in the street."

As to the daily drinking of some form of alcohol, while the weight of opinion was against it, several of the physicians had observed no ill effects from its use in moderation in themselves or their patients. Dr. J. Simms Woodhead, however, calls attention to the significant fact that when the body is being trained for any unusual exertion the use of alcohol is strictly prohibited.

ATHLETES SHUN LIQUOR.

During his athletic career at the University of Edenburg he says: "I was early impressed by the fact that nearly every athlete who was not already an abstainer became practically a teetotaler during his period of strict training, and in some cases had so to alter his routine of life that he found it almost impossible to do anything but keep in training. Those of us on the other hand who were teetotalers had to alter our daily routine of living comparatively little; we could continue our work in the classes and it was not necessary for us to refuse dances or dinners.

"It was not the dancing, the dining, or the working that upset men. It was getting rid of the alcohol. I may say most confidently that during my most successful athletic years I did my best class work, and during the whole of that time I do not know that I had to refuse a single invitation on account of training."

TREATING.

The habit of treating is as old as the human race. It is the most ancient rite of hospitality. No doubt Job spread before his friends something wherewithal to refresh their inner men before they sat down to mourn with him in the land of Uz. The Bedouin gives the stranger food and drink when he enters his tent and pursues and plunders him when he has left it. The South Sea Islander hospitably regaled the missionary before eating him. The wayfarer was ever welcome at the table of the Saxon manor house, and he who last went under the table showed the most appreciation of its lord's bounty.

The notion that the possession of a generous nature is best proved by filling one's guests' or one's friends' stomachs, whether they are hungry or thirsty or not, has flourished instead of decayed in the sunlight of civilization. Treating was formerly a prerogative of man only. Even if women were permitted to stay and see their lord and his friends feast, they usually had to retire when the flowing bowl began to circulate. Now, however, women are treaters on a large scale. Each season they give innumerable receptions and dinner parties, and every woman who accepts invitations to social functions is required by inviolable conventions also to give them. But men, especially American men, are still the most generous treaters. Does a man want to get business from another man? He gives him a drink. Does he wish to cultivate another's friendship or show himself a "good fellow"? He gives him a drink—perhaps two drinks. If six men, or a dozen, all acquaintances, happen to enter a drinking place together, it is not unlikely that each will buy drinks for the crowd before they leave, and that all will

go forth more or less wabbly in their underpinning.

If men treated one another, as women do, to punch, salad, and ice cream, or if, like women, they did not reciprocate their treats for a week or for several weeks, they would, like women, suffer no worse effects from them than occasional attacks of indigestion. But the treating habit, as it prevails among men, is one of the nation's principal manufacturers of spendthrifts and drunkards. The Anti-Treating League of America has been started by traveling men to abate the evil. It is a practical movement in favor, not of total abstinence, but of real temperance. It is desirable, not that the indulgence of the world's old spirit of hospitality and good fellowship shall be discouraged, but that the excesses which that spirit has led to shall be repressed. Any league having this aim deserves to be encouraged.

EMERGENCIES.

FIRST AIDS IN PERILOUS CONDITIONS.

Any help given to be useful must be carefully and quickly rendered, especially in drowning and poisoning cases. Too much attention, turning and moving by a crowd of excited people will probably do as much harm as too little. All cannot do the same thing at the same time. Let one take charge and let the others assist him. Keep the crowd of curious persons that always gather away from the patient. He will get more air, and those helping him will be freer to work. Always send for a physician in serious accidents. If one cannot be at hand immediately, as is often the case, help may be given pending his arrival if the suggestions below are remembered. They have been written as simply and concisely as possible, with the hope that they may be remembered and acted upon in time of need.

POISONS.

In all cases of poisoning there should be no avoidable delay in summoning a physician. The most important thing is that the stomach should be emptied at once. If the patient is able to swallow this may be accomplished by emetics, such as mustard and water, a teaspoonful of mustard to a glass of water; salt and water, powdered ipecac and copious draughts of lukewarm water. Vomiting may also be induced by tickling the back of the throat with a feather. When the patient begins to vomit care should be taken to support the head in order that the vomited matter may be ejected at once and not swallowed again or drawn into the windpipe.

Acids.—When acids have been taken use alkalies—lime water, magnesia and chalk water; follow with mucilaginous drinks—flour and water, flaxseed tea, etc.

Opium and Other Narcotics.—Cold water should be dashed over the face and head, the body flicked with a wet towel and an emetic given, such as mustard and water, and the patient must be kept awake. This may be accomplished by walking the patient and giving doses of strong coffee. If necessary artificial respiration, as described in the treatment of drowning persons, should be used.

Alcoholic Poison.—Use emetics—ipecac, mustard and water, sulphate of zinc and water—after which use strong coffee and keep the body warm.

Strychnine.—After emetics have been given the patient should be disturbed as little as possible, for the least thing induces a convulsive attack. The most important thing is to keep the person warm and quiet. Bromide of potassium may be given, twenty grains at a dose, repeated every hour.

Salts of Mercury and Arsenic.—These are commonly used as bug poisons and are powerful irritants, very often fatal, and when taken the whites of eggs and milk should be freely given, or flour and water, followed by an emetic.

Carbolic Acid.—Oleaginous substances, olive oil, sweet oil, etc., alcohol and water, lime water, sulphate of soda and magnesia, followed by emetics should be administered at once. Stimulants should be given, as there is always shock.

Oxalic, Sulphuric, Hydrochloric and Nitric Acids.—Use the oleaginous drinks described for carbolic acid, and follow with flaxseed tea.

Chloroform, Chloral and Ether.—Use cold applications on the head and chest and artificial respiration.

Iodine and Antimony.—Use flour and water or starch and water, followed by an emetic.

Nitrate of Silver.—Use salt and water.

DROWNING.

Handle the body gently. Loosen any clothing. Carry the body face downward, with the head slightly raised. No time should be lost in following out the instructions given below, which should be continued for hours without ceasing, or until a physician, who should be summoned immediately, shall arrive. The body should be stripped of all clothing, rubbed dry and placed in bed in a warm room. Warmth should be supplied to the body with hot water bottles or some other appliances. Cleanse the mouth of any dirt or mucous that may be in it, and draw the tongue forward with a handkerchief, holding it with the finger and thumb. This is most important, as it opens the windpipe, and should not be neglected. The patient should be placed upon his back, with head and shoulders slightly elevated. The operator, standing behind his head, should grasp the arms just above the elbow and draw them steadily and gently upward until they meet above the head, then bring them down to the side of the chest slowly and persistently at the rate of twenty times to the minute. These movements imitate expiration and inspiration. The trunk and limbs should be rubbed when breathing commences, and brandy and water may then be given.

BURNS AND SCALDS.

In severe cases the patient will suffer a great deal from shock. A stimulant should be given and the patient kept warm, wrapped in a blanket. The parts burned should be wrapped in common white wadding after an application of lime water and linseed oil, equal parts; castor oil, flour and treacle, baking soda and water or lotion of carbolic, consisting of a teaspoonful of carbolic to a quart of water, has been applied.

LIME IN THE EYE.

Use a lotion of sugar and water or vinegar and water.

FAINTING.

Lay the person flat upon the back, loosen the clothing, allow plenty of fresh air, apply cold applications to the face and warmth to the feet.

FITS AND APOPLEXY.

Raise the head, loosen the clothing and apply cold applications to the head.

BLEEDING AT THE NOSE.

This may usually be arrested by putting a plug of lint into each nostril and cold applications to the forehead and nape of the neck. Hot water or powdered alum may also be used, snuffed up the nostrils, or the vapors of turpentine.

BONES IN THE THROAT.

If a fish or other bone lodges in the throat insert the forefinger and press upon the root of the tongue. This will induce vomiting.

Another simple method is to get upon all fours and cough, or else take an emetic of mustard and water.

CONTUSIONS AND BRUISES.

Cold is the best application, either an ice bag or a piece of lint soaked in a solution of lead or boracic acid. If of a severe nature keep the lint moistened continuously. Tincture of arnica and witch hazel are also good remedies.

CUTS AND WOUNDS.

In bleeding from wounds or recent amputations press the finger or hand over the bleeding point, pressing on the main artery supplying blood to the wound. If this is not possible apply a bandage as tightly as possible above the wound. By tying a handkerchief loosely around the limb, thrusting a short stick through it and twisting it tightly an excellent tourniquet may be improvised.

The blood from an artery which has been severed is a bright red and comes in spurts with each beat of the heart. The color of the blood from an ordinary cut is of a dark purplish shade, and flows in a steady stream. All cuts should be washed out with warm water, to which one or two drops of carbolic acid has been added. The edges of the wound should then be brought together and held in position by strips of plaster, then bound up tightly with clean bandages.

SNAKE BITES.

The director of the New York Zoological Society says that reptiles, and supposedly venomous animals, yearly scare many thousands of persons to death.

The curator of snakes in this institution relates the following incident:

"I was in the heart of the cotton-mouth moccasin country a few years ago making a collection. One of my negro helpers swore that he had been bitten by a highly poisonous snake, and that he had saved his life only by getting dead drunk. I asked him to show me a specimen of the snake that had bitten him the next time he saw one, and a day or so later he pointed one out to me in the river. I spent half an hour chasing it, and when I had it at last, I found it was just a copper-bellied snake, which is every bit as harmless as the garter snake."

This experienced scientist says that the danger of any one's being bitten by a poisonous snake is very slight.

"A rattler will run whenever he can, and he always warns you when you come upon him unawares. A copperhead, also,

Pond lily beds as an example of tropical vegetation in city parks.

always tries to run away when a human being approaches; I have seen them scurrying away before me many a time. Of course, if it is in a dusty road, it can not easily get out of your way; but if you can step upon it when it is in full view, yours is the blame. As for the cotton-mouth moccasin, which is not found north of the Carolinas, it also runs, and, moreover, hides away in the swamps out of the way of travel. To these innate traits of the venomous reptiles is due the fact that residents in sections infested by them are practically free from danger."

WHAT TO DO WHEN REALLY BITTEN BY A VENOMOUS ANIMAL.

Whatever the portion of the body bitten, at once apply a ligature between the bite and the heart. If the hand has been bitten, put a ligature upon the forearm, about midway of wrist and elbow. A handkerchief will do, twisted tight by the use of a stick, until the flow of blood ceases, a condition which is easily ascertained, and can be brought about in a very few moments, an important point to remember, for the victim does not want to get unduly excited, thereby aiding the poison by stimulating the circulation and hindering quick, calm action.

The ligature firmly secured, proceed to treat the wound itself; if you are accompanied, your companion can be putting on the ligature while you are saving time looking after the wound.

If the snake has bitten squarely there will be two wounds, one made by each fang, through which the poison is injected into the victim. With a sharp instrument scarify each wound to its depth, making the cut in line with the other wound. Then scarify again, this time across the first cut. Be sure to cut to the full depth of the wound, so that the entire infected region will be laid open. If you notice smaller lacerations, caused by the reptile's teeth, scarify them also. They will be little more than skin deep, while the fang of the average poisonous snake, except the Florida species, is about one-quarter of an inch in length. A razor is the best instrument to use, since it cuts quickly, deeply and with only a tingling sensation, owing to its delicate sharpness. But, whatever the instrument, cut to the required depth.

Next, proceed to suck the wound for all you are worth, provided there is neither abrasion, sore nor bad tooth in your mouth, through which the poison could enter your system. The average mouth, however, is in a healthy condition, in which case no risk is run. Let us hope yours is riotously healthy. Spit the blood out, and keep on sucking diligently; suck as long as there is a possibility of bringing blood.

Now pour into the wound a solution of permanganate of potash; it is easily obtained. A four-ounce vial of this solution is sufficient, and enough crystals should have been dropped into boiled water to make it wine red; a few will do the work. Thoroughly saturate the wounds, getting the solution away down into them; it oxidizes the poison and destroys its toxic power. If you have a hypodermic syringe handy, follow up by injecting a very little of the solution around the wounds about three-quarters of an inch away.

THE USE OF WHISKY.

The wounds thus bathed, take enough whisky to stimulate you, and no more. In the case of a man this is about half a wineglassful, and for a woman or child perhaps not more than a tablespoonful. Do not take another drop until you begin to feel depressed or blue. Then renew the stimulant, being careful not to take more than before, and so continue.

The popular mind holds that the only correct thing to do when bitten by a snake is to dose the victim with whisky until he is dead drunk. Such treatment is the worst that could be imagined. The reaction always following a too liberal indulgence in whisky tends to paralyze the heart. That is also the effect of the snake poison, so they both join hands to bring about the victim's destruction.

WHAT NEXT TO DO.

Send for a doctor, but do not wait for a doctor to come to you. Time will be lost, and equally as important, the exercise of walking will keep your blood stirred and stimulated naturally, which is the prime object in combating the poison. You will also perspire, and thus perhaps throw off some of the poison through the skin. Walk energetically, but do not go so fast that you will overstimulate yourself and later bring on a harmful reaction.

When you reach the doctor you are in his hands. He will dress the wound with antiseptics, and undoubtedly administer stimulants. He could inject strychnine if the nerves were numb, as it is a terrific excitant. Whatever he does, your responsibility ceases.

But if you are so located that you can not get the assistance of a doctor, there is no cause for despair. Keep in as cheerful and normal a frame of mind as possible; regularly, whenever you feel yourself becoming depressed, take a fresh dose of whisky, and it is more than probable that you will recover, even though you may have to keep up the treatment for a week or more.

VACCINATION.—ITS FRIENDS AND FOES.—ARGUMENTS FOR AND AGAINST.

ANTI-VACCINATION.

At the anti-vaccination meetings it is pointed out that people suffer from lack of knowledge and that the theory of vaccination has not been strengthened by virtue of its age.

The most important objections made to the inoculation of virus as now practiced by most physicians are that it cannot be proven that smallpox epidemics have been lessened by its practice: that vaccine causes the system to become impregnated with different poisons; that there is an increased mortality from diseases inoculated into the system by vaccination, and the law of compulsion is considered un-American. It is claimed that vaccination is a "risky business" and a "filthy fad," which originated in a dairy maid superstition, first promulgated by a barber named Jenner.

To prove its inefficiency such authorities as Dr. Charles Ruata, Dr. Buckner Basel, Dr. Gregory, Dr. Cruewell, Dr. Stowell and the late Herbert Spencer are freely quoted. A number of periodicals

are published in support of the anti-vaccination theory, notably the Anti-Vaccination Inquirer of London and one published in Terre Haute, Indiana, called Vaccination. Dr. Gregory, medical director of the London smallpox hospital, in the Medical Times of January, 1852, is quoted as saying: "The idea of extinguishing smallpox by vaccination is as absurd as it is chimerical and it is as irrational as it is presumptuous." Another authority cited is Dr. Stowell, an English physician of twenty years' experience, who says: "The general declaration of my patients enables me to proclaim that the vaccination notion is not only a delusion, but a curse to humanity." Charles Ruata in the New York Medical Journal July 22, 1899, makes the startling statement that 98.5 per cent of the population were vaccinated and yet in the years 1887-88-89 42,272 deaths from smallpox occurred. In Italy there were 16,000 deaths, while 98 per cent of the people were vaccinated. The sweeping statement is made that "about 60 per cent of all physicians who have practiced their professions more than five years know that vaccination is not only dangerous, but entirely ineffective as a preventive against smallpox."

Many physicians claim that immunity can be secured by the use of certain preventive remedies. Revaccination is strongly objected to on the ground that no doctor is certain from the cicatrix whether revaccination is necessary or not. One prominent speaker cited the case of a man who was declared immune on account of a remarkably good cicatrix, when the fact was it was only the scar from the bite of a colt. The opposition holds that doctors who practice it should be made to pay damages in case of death or disability. They say that the mildness of modern epidemics is due solely to isolation and sanitation. "The whole world is vaccinated and yet smallpox exists."

Statistics from the armies of different countries are given to prove that soldiers vaccinated and revaccinated many times have not been immune from attacks of the disease. In fact, it is asserted that epidemics begin with the vaccinated and the revaccinated.

Some of the prominent speakers at anti-vaccination meetings have been those whose objection to the practice is based upon the loss by death of some member of the family as a result of vaccination and it is held that compulsion under such painful circumstances is little less than cruelty. In support of their opposition to its continuance many statistics have been compiled to show the cause of death to have been from vaccination. It is said that in England 25,000 children are annually slaughtered by disease inoculated into the system by virus, while by far a greater number are disabled or injured for life. It is contended that there is no definite way for physicans to determine the character of the vaccine used, and that there is no way of testing the absolute purity of what is placed upon the market. In the north of England a house to house canvass was made for the purpose of gaining trustworthy information, with the result that 750 deaths were alleged to be due to vaccination, while there were 3,135 cases of injury recorded. It is cited that nine cases of lockjaw occurred in Philadelphia in three days. Another instance mentioned is that out of forty inoculated

children nine died of vaccinia. In 1885 Dr. Andua, a prominent physician of Asprieres, vaccinated forty-two children. All were attacked with fever, and six were dead the next day. The health office of Berlin showed in 1891 1,000 deaths resulting from vaccination.

It is contended that no correct estimate is possible of the harm done by this vicious practice, as many fatalities are covered up; but it is responsible for the long death lists of erysipelas, heart disease, tuberculosis, pneumonia, kidney disease and insanity. In fact, almost any disease that flesh is heir to may be attributed to vaccination. Herbert Spencer is quoted as saying "that the ravages of influenza of recent years are directly attributable to vaccination and that la grippe was never such a menace to health until vaccination became almost universal." Infantile syphilis increased in England, from 1853 to 1883, in propertion to vaccination. Dr. Cruewell, considered by many a high medical authority, swore under oath: "Every inoculation of so-called prolectic pox is syphilitic poisoning." Thus it is contended that even if smallpox has virtually been annihilated, general mortality has increased, and there is every reason to attribute this to the practice of vaccination.

The fact that the town of Leicester, in England, has prohibited vaccination and that smallpox has been unknown there for years is held up as an example of what all towns would be without it.

Many of the opposition justify their opinions simply upon the ground that compulsion interferes with liberty and that taxation without education is tyrany. A strong expression used is that "rebellion to tyrants is obedience to God." The claim is made that the law was not passed at the instigation of nor by the wish of the people, but that it was through the efforts of "a few political doctors and in the interests of the vaccine trust."

In refusing to comply with the law, many agitators express themselves as being unwilling to become martyrs to a superstition, to submit to any interference with their religious belief (to this class belong Christian Scientists, faith cure adherents and various kinds of healers), but insist upon the right of every American citizen to enjoy that "American liberty which is supposed to grant to each and every one freedom of individual belief and action."

IN FAVOR OF VACCINATION.

The majority of medical practitioners throughout the world are strong in their support of the Jenner theory of vaccination and scarcely consider it worth while to attempt to refute the views of the "fanatical anti-vaccination party." Such authorities as John F. J. Sykes of London, John William Moore of Dublin, Pasteur, Koch and Sir John Simons will be freely quoted in this treatise. The mass of evidence confirming the protective power of vaccination and revaccination is irresistible and opposition to it is due principally to the objection to compulsion. The objects of compulsion are the absolute necessity of protecting the largest percentage possible of the population for the benefit of the whole community; to secure a regular and sufficient supply of lymph; to prevent undue haste and insufficiency, inferiority, or failure of lymph in times of panic. The abolition

of compulsion would mean the neglect of vaccination and the accumulation of unprotected persons in a community, so that in the panic produced by an epidemic vaccination would be overtaxed, with serious results, and there would be an insufficient supply of lymph. The ignorant and the improvident neglect vaccination as they do other prudent measures that bear remote results. Many of the medical fraternity contend that it might be well to do away with compulsion, as pestilence is one of the agencies by which overpopulation is regulated and that it usually picks off the weak and those not well fitted to battle with life.

Statistics showing the efficacy of vaccination seem to be conclusive, but it will be seen that they differ widely from those introduced by anti-vaccinationists. Both factions are positive that figures presented by them are correct. Regard is certainly due to the opinions of such eminent authorities as served on the German Vaccination Commission of 1884. In their opinion the credit of diminishing mortality in Germany was due to compulsory revaccination. Most important evidence is shown in reports compiled in England and Wales. Before the introduction of vaccination there were 3,000 deaths in every million of the population from smallpox, while in 1890 this disease caused only fifteen deaths in England, and the annual number of deaths in ten years, 1881-90, inclusive, was one-seventieth part only of the death rate of prevaccination times. It is held that vaccination not only greatly diminished the number stricken, but that it greatly influenced the death rate among those attacked. In Sheffield, in the outbreak of 1887-88, of 4,151 vaccinated patients 200 died, or 4.8 per cent; of 552 unvaccinated patients 274 died, or 49.6 per cent. If the death rate of vaccinated children under ten years of age, during this same epidemic, had been at the same rate as that of the unvaccinated there would have been 4,400 deaths, whereas there were only 9 such deaths.

In Prussia the mortality from smallpox in the year 1835 was 27 per every 100,000 persons, while in 1886, vaccination and revaccination being obligatory, the death rate was reduced to but 0.39 per 100,000 inhabitants. Only one great epidemic has occurred since vaccination was made obligatory—that of 1871-72—while in the preceding century there were 32 epidemics. The pro-vaccinationists do not claim that the mildness of modern epidemics is due solely to vaccination. Notification, isolation and disinfection are admitted as supplementary measures, while the severity and extent depend largely upon the season, dwelling, mode of life and care of the skin.

This is conceded to be a different age from that of Jenner, and yet certain conditions exist now that are conducive to the spread of the disease that did not exist in his time. Population has increased, particularly in cities, means of locomotion have multiplied and there is a closer commercial relation between nations than ever before, so that infection is easily transferred from one country to another.

Some persons should not be submitted to the operation of vaccination, as its success depends largely upon the condition of the blood and system generally. Many physicians refuse to practice it at all unless they have a personal knowledge

of the constitution of the patient. That death is sometimes due to its practice is admitted by those favoring it, but this is always the result of accident. According to the German commission previously referred to, "no probable increase of any particular disease has taken place as the consequence of vaccination." Any open sore is liable to infection. Death is frequently caused by no more serious accident than running a sliver into one's finger. Considering the immense number of vaccinations performed and with the same constant danger of infection as to any wound, it is quite extraordinary that so few fatalities occur. Want of care and absence of antiseptic precautions or use of human lymph are causes of infection or poisoning. Many fatalities have been traced to improper cleansing of the vaccinating needle. It has been definitely determined that only animal lymph should be used. The great advantage of the use of calf lymph is that it sweeps away any suspicion of the inoculation of other diseases. Syphilis cannot be communicated to animals. Lymph is now being prepared from carefully selected calves that are quarantined and closely observed for some length of time before vaccination, and before placing the lymph on the market the animal should be killed and tests made upon the body to insure its absolute healthiness.

Dr. Cory, the director of the animal vaccination station of the local government board, in his evidence before the royal commission of England states that from 1882-89 32,002 vaccinations were performed with calf lymph and that there were only eight deaths. Of these only two could be reasonably attributed to vaccination, namely, two cases of wound disease—cellulitis and erysipelas. This mortality is probably not even so high as that resulting from common cuts and scratches.

The case of the loss of six children out of forty-two vaccinated by Dr. Andua in 1885 as so frequently referred to by anti-vaccinationists, is explained by P. Bronardel of Paris, who shows that death was due to the use of human virus. That Leicester, England, has prohibited vaccination for years, and has escaped a scourge is due wholly to the fact that it is surrounded by a population which is protected by vaccination.

The evidence so far leads to the conclusion that the best defense of a community against smallpox is not the repeal of the law of compulsion, but in adopting the following measures: The use of calf lymph only, compulsory primary vaccination, in infancy, occasional revaccination, isolation of imported cases of disease, disinfection and sanitation. The present agitation will tend to educate the people of the community, will make physicians more careful in their selection of lymph, care of instruments and cleanliness of wounds.

The existence of the disease in the United States to-day is due in the main to individuals who resist attempts for the protection of the population. No man is responsible to himself alone for the care of his own body. An unvaccinated group of persons in a community are a menace to the health of the entire population, and it is contended that no one has the right to endanger the life of the entire community by refusing to comply with the law.

American liberty should grant to every citizen freedom of individual belief and action, but there are times when that freedom should be, to a certain degree, restricted.

HOW TO DETECT SYMPTOMS OF CONSUMPTION AND DIRECTIONS TO PREVENT ITS SPREAD.

During the last few years the state board of health has conducted exhaustive researches on the prevalence of consumption in Illinois, through which it was found that the disease is responsible for more deaths than typhoid fever, scarlet fever, diphtheria, all forms of bronchitis, influenza, whooping cough, measles and smallpox combined. It was also found that those dying from consumption were usually in the prime of life and of ages at which men are most valuable to themselves, their families and the state. Of the 7,000 persons who died from consumption in the state in 1903, 4,500 were between the ages of 20 and 50.

The estimated loss each year to the state from this disease alone is about $36,000,000. The investigations have demonstrated that an especial climate is not essential to the cure of consumption, and that the disease is curable.

The board recently issued a circular, embodying the result of its investigations. On the subject of "How to avoid consumption" the following is given:

"The important points in prevention are: Pure air, proper clothing, good food properly cooked, moderate rest and recreation, avoidance of all excesses; in other words, moderate living. The excessive use of alcoholic liquors lowers vitality, favors infection and hastens a fatal termination.

DIRECTIONS FOR SUPPRESSING CONSUMPTION.

"Don't spit on the sidewalk, floor or any place where the sputum will become dry and permit the dissemination of the germs which it contains. No spit, no consumption. If you are a consumptive, the mere spitting on the floor of your apartments may cause a further infection of your lungs. Favor the enactment and enforcement of laws prohibiting spitting on sidewalks, in street cars or other conveyances, or on floors or in hallways.

"If you are a woman, do not wear skirts which sweep the sidewalk, and thus carry disease into the house.

"Don't put into your mouth money or articles which have been promiscuously handled by others.

"Don't neglect to wash your hands before you eat.

"Don't sleep or live, if it can be avoided, in a room with a consumptive. Don't kiss a consumptive.

"Don't occupy premises formerly occupied by a consumptive unless the premises have been thoroughly disinfected. Remember that the germ of consumption retains its vitality for a long time.

"Don't drink out of any glass, cup, or vessel which has been used by another unless it has been carefully washed. Let this apply to all drinking and eating utensils.

"Don't work in a room where there is no fresh air. Have plenty in your sleeping and living rooms in both summer and winter. Fresh air helps to kill the germ. Avoid mouth breathing. Breathe through your nostrils. If unable to do this consult a physician.

COLDS OFTEN BEGIN CONSUMPTION.

"The history of a large percentage of consumption cases is the history of neglected colds. Watch your general health. A prescription for a cough may save your life and the lives of others. Avoid patent medicines. Don't moisten your finger or thumb with your saliva when you turn the leaves of a book or handle money or papers."

The board has established a laboratory at Springfield in which an examination of the sputum of suspected tuberculosis cases will be made without cost, provided the patient is unable to meet the expense of such an examination. Communications should be addressed to the secretary of the state board of health, Springfield, Ill.

On the symptoms of the disease the circular has the following:

"The onsets of all cases are by no means the same. In fact, many people have consumption and the disease is arrested in the very early stages before there have been any symptoms which would lead to a suspicion that the disease existed.

"The first symptoms may be loss of appetite and weight, fatigue on slight exertion, rapid pulse, fever in the afternoon and evening and a cough which is most noticeable in the morning. The cough may have existed for months with practically no impairment of the general health, or the slight, hacking cough usually worse in the morning, may have been so insignificant or may have occasioned so little annoyance, that the patient will deny having a cough at all or will remember it only after careful questioning.

"Some cases of consumption begin with simple hoarseness. There are other individuals who are subject to 'colds,' these colds occurring with increasing frequency and each one resisting treatment more stubbornly than the one which preceded it, these attacks leading up to the one which remains. Such an onset is so insidious that the disease is often firmly established before the patient's suspicion as to the nature of his ailment is at all aroused. Many cases progress to a serious stage, supposed to be 'chronic grippe,' 'chronic malaria' or 'dyspepsia.'

"Gradual loss of weight should make a person suspicious and should cause him to seek the best medical aid for careful physical examination and examination of the sputum for evidences. This is especially the case if, in addition to the loss of weight, there is loss of appetite with increased frequency of the heart beat, afternoon fever and morning cough. Any or all of these symptoms should cause the patient to seek at once the most competent medical advice."

STATE HOSPITALS.

Members of the board of health believe that the establishment of state hospitals will strikingly decrease the mortality and limit the spread of this disease, and they advocate strongly the establishment of such hospitals. It is expected that in the coming meetings of the legislature some substantial progress in this direction will be made.

HOW TO AVOID THE WHITE PLAGUE.

MONSTER RAVAGES OF CONSUMPTION.

Dr. H. M. Thomas says: "Of the 90,000,000 people in our land today 9,000,000 will die of tuberculosis unless we develop methods for its prevention.

"I desire to plead for such restrictive measures that this universal white plague which claims for its victims those in the flush and bloom of youth, in the prime of life, coming from the ranks of the fairest and best in our land, with all the possibilities of life opening before them, may be saved from tuberculosis.

"The age of those dying from tuberculosis averages from 18 to 40 years. This is usually the most productive period of life. The best results of education, culture and labor are then achieved. The climax of one's usefulness to the world is at its zenith. What an appalling fact to appreciate then that these deaths occur from a disease which is absolutely preventable.

VAST FINANCIAL LOSS.

"Viewed from the standpoint of money loss alone, $10,000 being the legal amount a human life is valued at in Illinois, all the expenses of maintaining our great government are not to be compared with the financial loss sustained by the nation from tuberculosis. The annual economic loss in Illinois is over $36,000,000, or at least $100,000 daily.

"How the people live is one of the most pertinent questions that can occupy our time, and the causes that lead to their death are of great importance. Nothing can be of higher value than to teach the race how to live longer, healthier and happier lives. Many untimely deaths attributed to the mysterious ways of Providence are due to rotten potatoes in a sunless cellar. Medical science declares tuberculosis is communicable, preventable and curable.

"Where pure air, pure water, pure food, judicious exercise, abundant sunshine can be had the disease cannot exist. The vast storehouse of life-giving forces is found in the inexhaustible resources of nature's laboratory.

OZONE AS LIFE-GIVER.

"From the unpierced heights and limitless expanse of the trackless skies comes the life-giving ozone. Its presence in our blood brings renewed life and vigor. The flagging forces of nature find in its subtle chemistry the antithesis of decay. The sodden skin, the halting step, the lusterless eye, the clouded brain, under its vitalizing influence, are rejuvenated. Would we find freedom from tuberculosis, flee to the orchard, the meadow, the sunlit plain and the majestic mountain top. There, bathed in nature's electrifying energy, will tuberculosis vanish. There will unbounding buoyancy supplant the insidious ravages of disease.

"Pure air, pure air, the most widespread of nature's blessings, and yet the hardest of them to get! How few trust pure air. Pure air is the one race necessity that can never be combined in a trust! In all the world it is that of which there is the most. Out of the twenty-four hours, how many do we breathe pure air? We do not stint ourselves in food, but we do in oxygen. We can live weeks without food; but for five minutes only with-

View of the Tower of London from a steamer on the Thames. Part of this famous building still remaining was erected by William the Conqueror in 1078.

out oxygen. If we are to be saved from tuberculosis we must breathe pure air twenty-four hours out of the twenty-four.

IMPURE AIR DEADLY.

"Oxygen reduces fever, aids digestion, gives refreshing sleep and heals the lungs. There is much fear of breathing night air. What other air is there to breathe at night but night air? Pure night air is healthful. Impure night air breeds disease. Breathe we must. There is but one choice, pure or impure night air.

"What are the sources of impure air? Mainly the home and the workshop. Tuberculosis is a house disease; it depends upon the home for implantation, growth, maturity and propagation. The house is the granary of the bacillus. Houses of one kind and another are the ordinary means of spreading tuberculosis. The house is the most frequent means and the workshop next. This is so because it takes prolonged intimate contact with a person, place or thing that has been intensely contaminated with tuberculosis matter to give rise to implantation. The home and the workshop are the two places where environment and sufficient length of contact for infection most readily exist. Probably three-fourths of all cases of tuberculosis conveyed from person to person are contracted in the home and one-fourth due to workshop environment.

HOME SHOULD BE CLEAN.

"Homes should be made clean, dry, airy and bright. Buildings in which are employed men and women should be made sanitary and have a correct standard of air supply and light supply.

"What are the habits and environments which make us receptive to tuberculosis? Worry, over-work, over-exercise, indigestible food, loss of sleep, vitiated air, constipation, over-stimulation. The four basic principles upon which rest salvation from tuberculosis are: pure air, pure water, pure food, pure thoughts.

"No medicine in a bottle ever cured tuberculosis. Twenty-five years of scientific struggle in the United States has demonstrated the absolute failure to effect a cure by drug domination. It is your god-given resisting power that cures. Collateral therapeutics, by which I mean baths, electricity, massage, magnetism, lung gymnastics, hydro-therapy, osteopathy, etc., have their proper place and use as an aid to nature. But they must always play a secondary role, and be subservient to the great agencies of air, water, food and exercise, without which all would succumb."

DELL'S MANIA.

Displaying all the generally accredited symptoms of hydrophobia, William Scott died six weeks after being bitten by a dog declared by physicians not to have been mad. Physicians who had attended the man during the last week of his illness disagreed as to the cause of death, and it is recorded in the books of the institution as being caused by Dell's mania, a rare disease of which only a few cases have been treated in the institution.

Scott was an automobile repairer, 33 years old. While returning from work the man was bitten by a small dog which

was being chased by a policeman. The animal already had been wounded, and was killed soon after it attacked Scott, whose right temple was slightly lacerated.

WOUND IS NEARLY FORGOTTEN.

Scott went at once to the office of a physician in Chicago, Illinois, where the wound was cauterized and dressed. At his dwelling that night he treated the incident lightly, and expressed no fear of further trouble from his injury. The wound healed quickly and apparently was forgotten by the man.

Three days before his death he became delirious. The wound again had become painful, and Scott complained of a contraction of the throat muscles and inability to drink. He rapidly became worse, and the ambulance was summoned to take him to the county hospital.

CASE PUZZLES PHYSICIANS.

Although the man displayed many symptoms of hydrophobia, the physician hesitated to pronounce the case one of a disease, the existence of which is discredited by many physicians, and the police were told the man was suffering from hysteria. At the hospital his condition became violent and several male attendants were necessary at his bedside at all hours to restrain him. Aversion to water, a barking cough, and attempts to bite his attendants, with many other symptoms, which popularly are supposed to accompany the ailment, were noted in the man's case.

At times Scott regained his mental faculties and declared his condition was not induced by any fear of the disease.

ONE PHYSICIAN SAYS HYDROPHOBIA.

Dr. Pugh, who first treated Scott, said that he is confident that hydrophobia was the cause of death.

"Every symptom of the disease was present," he said, "and the patient was not the type of man who would worry himself into that condition. He had almost forgotten the incident when the recurrent symptoms took place. I have attended several cases of the disease and although its existence is disputed there is little doubt that Scott's death was caused by hydrophobia."

TELLS OF RARE DISEASE.

Dr. M. W. Hall of the county hospital staff said the patient's death was the result of Dell's mania, an extremely infrequent mental ailment.

"There are many causes which could have induced the disease," he declared, "one of which might be fright and morbid brooding over his condition. There have been no cases of hydrophobia treated at the hospital since my entrance here."

HYDROPHOBIA.

Scientists claim that real hydrophobia is exceedingly rare but that the saliva from any animal when either greatly heated or enraged is dangerous to the blood of any person. The Pasteur treatment by inoculation is claimed to be only preventative, not curative. As hydrophobia poison is very slow the Pasteur method has a very successful record. The Buisson method is more simple and convenient. It consists in producing an exhaustive perspiration. A heated room with hot vapor, followed by hot bath, alco-

holic stimulants and sleep under hot covering, is the plan that has been also very successful. This may be continued by violent exercise and a brisk rubbing over the body with coarse towels dampened in alcohol. This treatment is said to have as extensive a record of success as any ever devised.

APPENDICITIS.

The frequency of public reference to this disease in late years has made it of peculiar interest. The appendix vermiformis, as its name implies, is about the size of an ordinary goosequill attached to the caecum or blind bowel on the right side of the abdomen near the hip. This tiny organ has no known use and appears to be a relic of a larger bowel that for some reason has gone out of use in the course of the evolution of man. This useless organ is particularly liable to inflammation which extends to the entire bowels and in its complications is very much dreaded and dangerous on account of the ulcerations produced, which finally eat through and let the poisonous matter into the cavities of the body. Its symptoms are deep pains, tenderness, fever and rigidity of the abdominal wall on the right lower side. A surgical operation is an infallible cure if done before the inflammation gets fastened upon the bowels. Whenever appendicitis is suspected, a competent and reliable physician should at once be consulted.

MEAT AND APPENDICITIS.

In Porto Rico appendicitis is not found among the vegetarian population, but it does occur among the Americans who eat meat, says the Parisian Journal Cosmos. In France, among vegetarian peoples, appendicitis is very rare or not present at all, while the disease increases in proportion as the use of meat is increased.

In Roumania statistics show that there is one case out of 22,000 cases of illness among the vegetarians, and one case out of 221 cases of illness among the meat eaters of the country. The same observations might be made of Belgium, Algiers, Tonkin and New Caledonia.

In the prisons and in all the closely packed institutions, which are always the easy prey to grippe, and where the regime is almost solely vegetarian, one might say there are no cases of appendicitis. At Clairvaux, since 1900, Dr. Lutier has only seen a single case of appendicitis among the prisoners, and at Roquette, during five years, there has been observed only two or three insignificant cases, the treatment of which without operation has only required three or four days.

The examination of the statistics of many schools and convents give the same results, there being no appendicitis where the regime is vegetarian. At Nantes, among the Clarissas and the Carmelites, who are exclusively vegetarians, there is no appendicitis, the same being true for the Carmelites of Amiens and the Trappists of Blagnac.

It is thus only reasonable that M. Championniere should conclude that meat eating favors intestinal affections and appendicitis following the grippe, and that the reduction of this regime is to be advised.

A MADSTONE AND STORIES OF ITS CURES.

A little stone no larger than a man's thumb, and not at all beautiful, is held priceless by its owner, and an offer of $5,000 for it has been refused.

It is the "Bundy madstone."

It has the curious faculty of curing blood poison, which never yet has failed. When applied to snake bites, dog bites, or any other poisonous wound, it sticks close, sucking out the poison, until when it has finished its work it leaves the blood as pure as nature made it.

Henry Bundy, of New Castle, Ind., owns this stone. He is 78 years old and it has been in this family since 1810, when an Indian woman presented it to his father. The medical profession is anxious to secure this little curative for scientific use and research. A Chicago university made the offer of $5,000 and Mr. Bundy has been urged to start a hospital with it. This he refuses to do, but he freely allows its use by whatever sufferers apply. He is not rich, but no money can coax that precious stone from him.

Desperate attempts have been made to steal it, and now the little stone is kept in a safe deposit vault in the First National bank of Indiana.

A RECENT CASE.

Malignant cases of poisoning which have been pronounced incurable have been cured by the madstone, and the latest cure was made on E. R. Hillman, of New York, who traveled post-haste to Indiana when his own doctor had been unable to extract the poison of a mad dog's bite.

Mr. Bundy immediately applied the madstone to the lacerated flesh and there it clung tenaciously, drawing out the fatal poison from the wound. The teeth of the suffering animal had gone through the flesh to the bone and the wound presented a most serious appearance.

The stone clung to the wound for three hours, puckering the skin around it as it sucked out the poison. When it finally dropped off it was thoroughly cleansed and applied again but it refused to cling, thus showing that all the poison had been drawn from the system and Mr. Hillman, feeling perfectly well, returned to New York.

He has suffered no ill effects from the bite and the fame of the madstone has grown apace since the circulation of Mr. Hillman's story. Others have come forth with proof of its efficacy and many hospitals are eager to secure this valuable aid to medicine.

DISCOVERED BY INDIANS.

The madstone was discovered by the Indians, who were superstitious about the manner in which it worked cures. Each Indian medicine man sought diligently for a madstone if his tribe did not already have one, and it was guarded when found as one of the most precious treasures of the tribe.

The little stone resembles a soft bone and has a spongy appearance. It is of a light brown color, one inch long, half an inch wide, and one-fourth of an inch in thickness. But then this Bundy stone is only half the size of the original article, the other half, which is perhaps the only other of its kind in existence, is in the possession of some Indian tribe.

When placed under a microscope the

stone presents a brilliant appearance, throwing out many colors and being covered with small crystals.

A SQUAW'S GRATITUDE.

Mr. Bundy's father brought the stone to Indiana from North Carolina in 1815. Bundy, then a small boy, was terribly afflicted with scrofula. An old Indian woman passing one day informed the parents that she could cure the child. On being asked the remedy she produced from her blanket this stone. It was applied to the sores and in two months the disease was gone, and it has never given him any further trouble. She then made her home with the family, and on their departure for Indiana some years later she cut the stone in halves and presented Mr. Bundy with the piece he now has in token of her gratitude for the kindness shown her by the family.

The stone was stated by the Indian woman to have been a sort of growth found in the stomach of a deer, and it is said many hundred deer were killed before this one was obtained by the medicine men of the tribe.

When the present Mr. Bundy's father died he gave the treasured stone to his son, Henry, together with the list of 240 persons who had been cured of scrofula or saved from an attack of hydrophobia through its agency.

REMARKABLE CURES.

Mr. Henry Bundy has had the stone for forty years, and in that time has effected with it about 150 cures. From the east and the far west, up from the south and down from the regions of Canada patients have come to Mr. Bundy to be cured and not once has the little stone failed to perform its work successfully.

The Bundy Madstone.
(From a photograph much enlarged.)

One mother brought her 12-year-old son all the way from California to Indiana to have Mr. Bundy place the madstone on a wound from a rusty nail. Blood poison had set in and the California physicians had told the mother that the limb would have to be amputated and declared that it was doubtful whether

even such severe measures would save the child's life. An old soldier of the Golden Gate city hearing of the case sent word for the child to be taken to Mr. Bundy. For twenty-four hours the madstone clung to the wound, and little by little the swelling and discoloration of the flesh around the sore subsided, and when the stone dropped off the little patient was free from all danger.

SAVED THE BRIDE.

The most romantic case was of a young couple from Texas. They had been but recently married, and were traveling in a carriage through the states. One evening the young woman plucked what she thought to be some sassafras leaves and began nibbling them. In a few hours she became ill, and upon consulting an Indiana doctor was told that she had been poisoned. The leaf had been of some other plant. The usual remedies were applied with but little success and the young woman grew steadily worse.

The physician spoke of the madstone and its powers and said that although it had never been tried in such a case it was worth an experiment, as no harm would result from the trial, and the young woman could not possibly recover unless by a miracle.

Mr. Bundy brought the stone to her bedside promptly, and cutting a gash in her left arm placed it on the wound. Twice the stone dropped off and hope began to wane. A third trial, however, proved successful—the stone clung. Three days and three nights it drew forth the poison, being cleansed five times, and when at the close of the third night it tumbled off, the sufferer was out of danger.

A DIFFICULT CASE.

The longest clinging record of the stone was in the case of an old soldier whose system had been thoroughly saturated with poison from a bullet wound. The stone in this case clung for nearly three weeks, and during the last three days the sufferer experienced sharp pains as though he were being cut by a knife around where the stone clung. This is the only case on record where the patient has felt the poison being drawn from the system.

When the stone refuses to adhere any longer to the wound it is cleansed by an immersion in milk and warm water. As the poison leaves the stone which is honeycombed, the milk and water separate; the milk turns a dark green, and when all the poison has left the stone it rises slowly to the surface. The stone is placed upon the wound after each immersion until it refuses to cling.

Mr. Bundy is always ready to use his remarkable stone and he hopes to make the name of Bundy famous by the number of cases pronounced incurable which have been successfully treated by the madstone.

COLDS AND HOW TO PREVENT THEM.

How to keep from catching cold is the most perplexing of all winter problems. A woman should not take cold in the winter any more than in the summer, but actually she does.

It was only a little while ago that the

Kneippists told people that they would never catch cold if they would only toughen themselves. Here are some of the remedies of the Kneippists: Drink cold water; bathe in cold water; liquid food; go in a natural state as much as possible; let your body breathe.

Walking in the grass was their most famous cure, and it was a common sight to see ladies walking in the grass in Central park in the morning, in their bare feet, trying to take in health and nerve force through the pores in the soles of their feet.

Nervous people, and people who caught cold easily, were specially advised to walk barefooted in the grass every morning before breakfast.

If you go to the French cures to-day, you will see this same custom. Pretty young women and homely old ones are out early in the morning, barefooted and walking in the grass. They choose lawns with the deepest growth, so that the ankles as well as the soles of the feet may benefit.

But, somehow, walking in the grass barefooted before breakfast does not always keep people from taking cold.

Yet to avoid taking cold is not at all difficult, if you will only get out of the habit of taking cold. The habit of catching cold grows upon one. One cold leads to another until the colds become chronic.

There are ways to keep from taking cold in winter, and here they are. Follow them and you will never have a cold.

Begin by getting rid of your present cold.

Eat regularly. Colds seldom come if the stomach is properly filled.

Don't go out into the cold air on an empty stomach. If you are invited out to dinner, take a cracker and a sip of wine before you go. If wine drinking is against your principles, then take a swallow of hot milk or even of hot water.

Never worry. Worry prevents digestion and gives one a cold. If worry assails you, throw it off, for it will surely breed a cold.

Don't overload your stomach. And if you feel chilly, take a dose of calomel. This is the advice of a physician who says that colds can be warded off in this way.

There is a great professional beauty in England who keeps her looks all winter by doing certain things.

First, she sleeps in a very hot room. This is contrary to custom. But she says that a hot room well aired, with the windows open and the heat pouring in, is the best for comfortable sleep.

Colds come in the night, when the body is little fitted to resist the attacks of cold. Sleep in a warm room, with plenty of covers over you and the windows open. That is the way to keep from taking cold. Don't sleep cold.

If you feel that you have taken cold, go on liquid food. Queen Alexandra for twenty-five years has made it a practice to go on liquid food at least one day a week. She gives her stomach a rest.

She used to be a victim to coughs. One winter her physician, a specialist from Berlin, took her in hand and gave her these rules, which were faithfully followed out:

Liquid food one day a week, and nothing else. The food consisted of consomme, raw eggs, broths and all kinds of sweet wines. Crackers were also allowed.

When she went out she was bundled up to keep out the cold. She was advised to put on all the clothing she needed.

Then there was another rule, and this was to wear no flannels in the house in winter. Keep the rooms at summer heat, which is just under seventy degrees, and you will need no flannels. It is as warm in your boudoir in winter as it is in summer. Therefore, you need no flannels.

But, when you go out, be sure to bundle up well. That is the way to do. Keep the body at an even temperature all the year around.

As to bathing in the winter time, cut it out. Don't go crazy on the subject of baths. In old fashioned times they had few bathtubs, and there were fewer colds.

Women get up in the morning on a zero day and plunge into a tub of cold water. They are weakened by their long night's fast—for one does not take food when one is asleep—and, then on an empty stomach, they plunge into the water, lowering their vitality still more.

Bathe enough for all practical purposes, but do not go crazy on the subject of cold water baths. Keep the body warm and comfortable.

Catching cold is largely a matter of common sense. One New York woman takes a light sweet wine when she feels a chill coming on. A Baltimore beauty goes in for a little whisky when she feels cold. And before going out into the cold air she takes a teaspoonful of brandy, or of whisky, or any other stimulant she has handy. It keeps her from catching cold.

Women who do not take stimulants can sip hot milk or hot water. There is a woman who takes a cup of old fashioned catnip tea.

The English women ward off chills with a cup of good tea, and never would they think of venturing out upon a very cold day without a cup to start the circulation. On coming in they drink tea again.

Whatever the beverage may be, don't neglect to take something, just to take off the chill and start the blood to circulating. Even coffee is better than nothing at all.

It is generally supposed that wet feet give one a cold. On the contrary, they are not injurious. You can walk half a day with wet shoes and catch no cold. But, of course, you must remove them as soon as you stop exercising.

A Washington woman came down with a severe cold in her head. She was so hoarse she could not speak. Consulting a doctor she learned how to cure her cold.

"I am to stand in line with Mrs. Roosevelt tomorrow evening," she said; "what in the world can I do to get back my good looks?"

The doctor advised her to wring a pair of stockings out of ice water. "Now," said he, "put on two pairs of heavy woolen stockings over them and go to bed."

She stayed in bed all that day, sleeping and sipping hot tea. And the next morning she awoke perfectly well.

Society women these days are taking the rest cure for colds. They give up everything and go to bed. It is the best thing in the world.

They lie in bed for a week with a book sleeping and reading and writing, doing anything except working. It is rest of

mind as well as rest of body that they need.

Exercise will work off colds. Eat your meals regularly and take enough out of door exercise and you will be pretty sure not to take cold. If you are chilly, take a dose of something to set the blood circulating and then get out in the open air and walk. It is the best thing in the world for you.

There are exercises that start the circulation and they are arm and leg exercises. There is one woman who goes into the gymnasium every day, even the coldest day in winter, and puts on a short sleeved gymnasium suit. She then takes her exercises.

And the result is apparent. She is pretty, her complexion is clear and she never takes cold.

RHEUMATISM AND PNEUMONIA.

IS RHEUMATISM CONTAGIOUS?

This question may appear bizarre, but at the same time there are cases in which it may well be asked. A German physician is convinced to such a degree of the contagiousness of this disease that he has demanded and has obtained at Leipsic the creation of special isolation for rheumatics, in order to prevent their spreading the disease. Leaving aside the numerous cases where two or more persons have been afflicted with rheumatism at the same time in the same house, and where we may clearly be permitted to believe that the illness of all of the persons has had a common origin, we find some examples which may lead us to admit the possibility of contagion. We see, for example, children attacked with articular rheumatism a few days after this disease has attacked the father. Again, we have a case mentioned by M. Talamon, in which a child was attacked by articular rheumatism, which lasted eight days. A few days later the sister of the child, but younger, who slept in the same room, was attacked by a rheumatic affection which killed her. We may also see conjugal rheumatism, or rheumatism which passes from one to the other of two married people. For example, a man perfectly healthy is taken with rheumatism a few days after his wife suffers a rheumatic attack, the wife being a confirmed sufferer, and here it seems we have a well-defined case of contagion.

PNEUMONIA.

This treacherous and dangerous disease may occur in connection with bronchial and other affections of the air passages, induced by "taking cold." An attack is usually sudden and generally commences with a chill, frequently accompanied by what are called rigors—shivering, chattering of the teeth, etc. In the majority of cases this occurs during the night and after exposure. The chill is severe and prolonged, lasting from half an hour to several hours. About the same time, or soon afterward, a pain is felt underneath the nipple on one—the affected—side. This pain is sharp and is described as "stabbing." It is aggravated by coughing, sneezing and when the patient takes a "long breath." Fever sets in early, and is one of the first symptoms. It usually runs very high, as is indicated by the

Fig. 1. A well trained dog driving a young chick into a cup.

Fig. 4. Obedience.

Fig. 2. Careful work.

Fig. 5. Incipent rebellion.

Fig. 3. Hesitation.

Fig. 6. Accepting the situation.

great heat of the skin. One peculiarity, seldom noticed in other affections where there is high fever, is often observed in this disease—the skin is moist from the outset.

WHY BIG, HEALTHY PEOPLE DIE EASIEST WITH PNEUMONIA.

An ingenious writer in Medical Talk gives an interesting explanation of why strong, healthy men and women are more liable to have typhoid fever, and when they do have it they are more liable to die as a consequence of it.

As is well known, athletes are more liable to die of pneumonia than people who are not highly developed physically. The reason for this is that in the case of athletes the breathing capacity of the lungs has been greatly increased by athletic exercises. Nearly the whole of the available lung has been brought into constant daily use. All of the latent air cells have been developed, and when acute disease attacks the lungs it has greater area over which to spread, and the pneumonia is of a more virulent and active type.

Another reason why athletes are not so liable to recover from pneumonia is that they have no latent lung to call into action after the disease begins. In the case of ordinary men and women at least one-third of the lung surface is in a latent or unused condition. When disease sets in it attacks only the active portion of the lungs. This leaves the person with a little reserve lung, which may be whipped into action after the disease has been developed.

Not only do the inflammatory processes of pneumonia have less surface presented for their ravages, but there is latent lung which can come to the rescue of the patient in the later stages of the disease.

Something very similar to this is true in the case of robust people having typhoid fever. It is a very curious fact, not generally known, that the small intestine differs in length in different people. Gray gives the average length of the small intestine to be twenty feet, but anatomists who have given this subject special study have found the average in the adult male to be 22½ feet and in the adult female 23 1-3 feet. In an analysis of 100 cases the shortest small intestine observed was 15½ feet and the longest 31 feet 10 inches, a difference of over 15 feet.

This surprising variability, when properly considered, is a very significant fact. The small intestine is very important to digestion. It is here that the digested fluid of food is mainly absorbed by the blood vessels and lacteals. As the dissolved fluid slowly moves along the tortuous canal, the nutritious portions are gradually absorbed by the blood vessels of the mucous lining. It is very easy to see that the length of the tube has an important bearing upon the absorption. Other things being equal, the longer the tube the more perfect the absorption will be. A tube thirty feet long, folded and twisted upon itself, would present more than double the obstruction to the passage of food than a tube fifteen feet long would and thus would become more than twice as valuable as a digestive organ.

It is a fact that some men have double the length of a small intestine that other men have, and also a fact that women on the average have a greater length of small intestine than men, this would at least help

to account for their differences in vitality, which every physician has noticed. As a rule, women will bear long strains and hunger better than men. Some men can go twice as long without food as others can. Some persons are hungry and faint if they miss a single meal, while others can go without food for twenty-four hours or longer with little or no inconvenience. The vitality in the length of the small intestine would certainly go a long way to account for these differences. The blood vessels and lacteals of the intestines perform the same function for man that the roots do for plants. The roots absorb from the earth nutritive material. The tree is strong and of rapid growth in proportion to the numerousness of its root.

LOSING MEMORY.

Among nervous affections which are of not infrequent occurrence that known as aphasia, or the loss of the power of speech, is of great importance. More especially is this subject of importance because loss of language is a condition associated commonly with brain troubles other than those which are intimately concerned with aphasia itself. Let us begin our study of this interesting topic by calling to mind certain prominent facts connected with the brain itself. Our big brain exists in two halves or "lobes," which are separate above but connected below by a kind of bridge. Each of these halves can exercise in its way a certain amount of independent action, but we may take it for granted that our full intellectual life is only rendered possible through the concerted action of both halves.

TWO BRAINS.

One very important point consists in the knowledge that each half of the brain controls movements of the opposite side of the body. If we are right-handed, this means that we are left-brained. A left-handed man, on the other hand, may be regarded as dominated by the right lobe of his brain. If we think of all the actions we are able to perform with our right hand, and unable to discharge with our left, we may see that the left side of the brain falls to be regarded as the more active of the two. All we know of the brain's duties supports this view. The left half in ordinary people is the controlling lobe, the right playing second to it. We have also to take into account that the really active parts of our brain are the brain-cells. These are microscopic living things, the diameter of which does not in many cases exceed the one-five-thousandth part of an inch. There are many millions of such cells in the outer layer of the brain and in other parts as well. They are the real governors of our lives, and represent in this way the parliament of the body, certain of the cells dealing with the highest operations of our mind representing the cabinet of our frame.

THE USE OF THE TWO BRAINS.

Now, if each half of the body is governed by the opposite lobe of the brain, it follows that disease of one side of the brain will be marked by its effects on the

opposite side of the frame. If a man suffers from rupture of a small blood-vessel, or from the plugging of such a vessel, in the left brain, he will show paralysis, or loss of muscular power on his right side, and vice versa. This would be called a case of paralysis arising from apoplexy, an ailment showing such symptoms as have just been described. The effects of paralysis thus brought about naturally vary with the extent of the brain injury, and with the particular part of the brain affected. Sometimes both sides of the body are paralyzed by the apoplectic "stroke," as it is popularly called. It is as a result of some such process that we find our faculty of speech to be affected, and this result in turn will depend upon the amount and situation of the derangement represented in the brain.

LANGUAGE CENTER.

Science has discovered that the langauge centre, or sub-office, in the brain is situated in the left side at a point which may be roughly described as situated above, and in front of the ear. To be exact, the speech-centre lies in the third left fold of the brain on the forehead region in a part known as "Broca's fold." This is the collection of brain cells set apart for the exercise of language, that highly distinctive feature of man. When this part is diseased, aphasia is produced; but the curious fact remains that we have a duplicate speech-centre in the right side of the brain, only, in the vast majority of us it is not in use. Because the left brain has acquired the supremacy in other directions, it has apparently gained a pre-eminence in the matter of the exercise of language. One very interesting point is found in the fact that when the left centre has been thrown out of gear or destroyed, the right speech-centre may sometimes replace it in its work. Ordinarily, however, the right one remains dormant.

CONFUSION IN THE USE OF WORDS.

We are now able to understand what "aphasia" means. Our speech centre being affected, we may either lose the memory of words, or may say words, but use the wrong ones, mistaking names, and saying "watch," for example, when a "key" is shown us. Sometimes, too, the muscles of speech are disordered, and words cannot be formed. Also the power of writing words may be absent in aphasia, for it seems as if the expression of our thoughts in writing is so near akin to that whereby we express them in speech, that destruction of the speaking brain-cells usually affects those which control our writing as well. A person afflicted with this ailment, then, may either be unable to speak, or may say words which do not express his thoughts at all. Sometimes he can read, as if the reading cells were less affected than those controlling speech, but he does not remember what he has read as a rule. More astonishing is it to find a person who has lost his own language may speak or read French, German, or other foreign tongue with which he is acquainted. We account for this result in the view that certain brain groups of cells perform different functions or duties, and that those concerned with the foreign language have been less affected than those dealing with the patient's native tongue.

COMPLEXITY OF THE BRAIN.

All these considerations show us how very complex are the arrangements of the brain whereby our existence is governed, and how a very slight upset may occasionally produce severe results in respect of the disturbance both of mental and physical actions. In the case of aphasia there is usually a history of an apoplectic seizure, or at least of some brain trouble of a more or less defined character. Slight cases get well, severe ones are naturally of less hopeful character. The treatment resolves itself into the extreme care of the patient. Absolute rest is necessary—freedom from all bodily and mental worry. The general health will require accurate and constant supervision, because recovery will be aided and promoted by every measure calculated to strengthen the body at large. Especially must digestion and the state of the bowels be attended to. The physician, if he suspects any special origin of the brain trouble, will treat that by the administration of appropriate drugs. A good deal can be done in the way of teaching the patient to speak, thus slowly repairing the old memory for words, or forming a new one. It can readily be understood that in an ailment of this kind direct treatment is an impossibility. All we can do is to favor the return of the missing function, by strict attention to the health.

PALPITATION OF THE HEART.

A considerable deal of alarm is often needlessly experienced by people who suffer from palpitation. By this term is meant irregular and often excessive action of the heart. We perpetually hear people speaking of their suffering from "a weak heart," as they term it, when they ought rather to talk of irregular action of the central organ of the circulation. They will worry over fancied heart affections when in reality they suffer simply from a little upset in the heart's working. As a rule the causes of such irregularities are not difficult of discovery. We shall presently note they may owe their origin to infractions of health laws and conditions such as are easily remedied by the exercise of a little common sense.

A MARVELOUS MUSCLE.

The heart is a hollow muscle. Being a muscle, its substance consists of the same substance as the "flesh" of the body, which is the source of our movements. It is, therefore, by aid of the same kind of force, or energy, that moves our legs and arms that blood is driven through the body. Now, like every other muscle, the heart demands certain conditions for its healthy working. It requires a due supply of good blood to nourish it; it resents being overworked, and, like other muscles, it grows tired; while when it is subjected to strain it rebels. Note next a very important distinction between two types or kinds of ailment—a distinction I have had occasion before to point out in this column. The first type of disorder is what we call a "functional" ailment, the second class receiving the name of "organic" troubles.

IRREGULAR MOVEMENTS.

Vastly important in the case of the heart is it to bear in mind the wide difference between the two. A functional

ailment means simply a derangement in the working of an organ. There is no change in its structure. The machinery is perfect, only it is acting irregularly. It is the case of the watch which is going too fast or too slow. A touch on the regulator puts matters right. If, however, a screw is loose, or a wheel off the balance, the case is different. There is an accident to the machine and its structure here represented, and perfect action cannot be expected until that accident has been repaired. In the same way a heart which is beating irregularly from a simple cause is not diseased in the true sense of the term, any more than a stomach which has been irritated by unsuitable food is necessarily altered in its structure. But a heart whose valves are thickened or defective represents a case of organic ailment, just as a stomach which is ulcerated fails to be included in the category of like troubles.

SERIOUS SIGNS.

The vast majority of ordinary heart-disturbances are of the "functional" kind. It is true that cases of serious heart troubles exist, and demand the best medical aid and care that can be obtained. These are marked by signs and symptoms nobody can mistake by reason of the discomfort they cause, and by reason also of their continuance. But when people ordinarily speak of their hearts being affected, they simply indicate irregular heart action, and often needlessly alarm themselves and their friends. Coming to practical details, let us note first of all that palpitation can only be regarded as a serious sign when it is constantly present. If a person is rarely free from irregular action of the heart, his only wise course is to see a physician, for medicine has many aids even for damaged hearts. If the attacks are only experienced at intervals, that is a different matter. Such occasional attacks are common, for example, in anæmic or "bloodless" people, who become short-winded on the least exertion, a result due to the poor quality of the blood. Stout people may suffer also from this ailment, but in their case there may be actual weakening of the heart from its developing a fatty condition.

CAUSES OF PALPITATION.

More common causes of ordinary palpitation are not difficult to discover. Prominent among them is abuse and excess of tobacco. Men who smoke the stronger kinds of tobacco frequently complain of heart-pain and the like. Very bad attacks are brought on by over-indulgence in cigarettes. Young people seem especially to be liable to suffer in this way. The drunkard is another victim of palpitation, owing to his particular vice. When he complains of "that sinking feeling" which follows on his debauch, he is illustrating the depressing influence of alcohol on his heart. Then he resorts to "a hair of the dog that bit him," and whips up his already tired heart into activity by a morning dram, thus accentuating and increasing the evil. Women who over-indulge in tea are equal sufferers, especially if they are otherwise poorly fed. Coffee has a curious effect in inducing palpitation in certain individuals, and this fact should therefore be kept in mind by sufferers. Often palpitation will appear if exercise is taken too soon after a meal, and I warn sufferers

against heavy and late suppers. A loaded stomach exerts a very distinct influence on the heart, and palpitation at night is frequently to be traced to a late meal, especially if it be of indigestible nature.

Suppose, therefore, that a person complains of palpitation occasionally, there should be an inquiry into the habits with reference to the points. Alteration of the erroneous way of living will usually suffice to cure the condition. Also suppose that the palpitation is confined to the heart, that is to say that there is, for example, no pain or discomfort felt in the back or in the right side, then we may feel fairly sure the case is trivial in its nature. In serious heart trouble we should find dropsy and swelling of the feet and legs, and blueness of the lips, with constant breathlessness on the least exertion. These last are signs which should never be neglected, and the physician's aid should be sought.

DIZZINESS, OR GIDDINESS.

In the first place we must note that all degrees of giddiness may be found represented when a series of cases is examined, and it is an important point to note the extent of the seizure. Nobody minds a passing symptom of this kind, due as often as not to stomach disturbance, or a trifling upset of the liver, but if attacks become frequent and increase, not only in number but in severity, we may then reasonably suppose that some condition more serious than stomach irritation has induced the symptom. The simplest cases, then, arise from digestive disorders. In them we find a history of, say, dyspepsia. There is some degree of pain or discomfort after eating, for example, and as a rule constipation is present. I believe the explanation of a good many cases of giddiness is really to be found in the fact that matters not duly excreted from the system are absorbed into the blood, and act as poisons upon us, one symptom being the familiar "swimming" in the head.

LIVER TROUBLES.

There is another point worth remembering in this connection. If the disturbance is due to liver-trouble, a very common cause and origin, we meet with floating specks before the eyes, and we shall in such a case find headache present as well. Here there exists bilious derangement, which may or may not end in a smart bilious attack, where the giddiness is succeeded by vomiting of bile and by the other disagreeable symptoms many of us know only too well. Now in all such cases, it is a safe rule to give a small dose of calomel, three grains will suffice, and follow this by a saline aperient. The blue pill at night and black draught in the morning of the old doctors was and is an excellent remedy. There must be care in respect of what is eaten. Excess of meat is to be avoided, and the diet, indeed, should, for a day or two, exclude all flesh foods (save, perhaps, a little white boiled fish), and should consist of milk puddings and farinaceous foods in greater part.

REMEDIES.

Alcohol had better be avoided altogether, for it is a too common cause of giddiness arising from a disordered liver,

The giddiness of the alcoholic subject is easily explained, because his brain is being poisoned by potations, and his nervous system at large is in an unstable condition. But alcohol will frequently produce such effects in perfectly temperate people, so it is well to bear the fact clearly in mind. If any further medicine is needed in such simple cases, a dessert-spoonful thrice daily in water (between meals) of the following mixture should be tried: Dilute nitro-muriatic acid two drachms; compound tincture of gentian, three and a half drachms; liquid extract of dandelion up to four ounces.

SEA-SICKNESS.

Giddiness may, however, have other origins than those represented by digestive disorders. Naturally, as the nervous system is that whereby we are kept in equilibrium, as it were, it is obvious that all cases of "swimming" in the head must be referred to the brain directly. It is the different causes which affect the brain that constitute the real puzzle of giddiness. A familiar example of such brain-disturbance is seen in the case of sea-sickness. Here, for one reason or another, the brain is acted upon by the motion of the vessel, and by our attempts to keep in touch, so to speak, with what we know to be the level condition of things. There is a very curious disease, of which giddiness is a prominent symptom, and which lends support to the view that sea-sickness is largely a brain-trouble. This ailment is known as Ménière's disease.

SPECIAL CASES.

The patient here suffers from constant giddiness, and not merely from a passing seizure. In addition the walk is of staggering kind, and there is shown a tendency to lean or fall to one side. Noises are complained of in the ears, with deafness, and vomiting occurs, being, as in brain cases, of an easy character, and not accompanied by the retching familiar where the stomach is the seat of the trouble. Now it was discovered by a distinguished French physiologist that a certain part of the internal ear, known as "the semi-circular canals," is concerned with our power of preserving our equilibrium. We are able to walk straight, in other words, largely through the operation of these canals, aided, no doubt, by brain action. Disease of the canals is therefore marked by a kind of physical upset, while, no doubt, giddiness may also be induced by undue pressure in other parts of the organ of hearing. Where, therefore, giddiness and the other symptoms described become more or less permanent, a physician should be consulted at once. Large doses of bromide of potash will probably be given; while salicylate of soda has also been employed in the treatment of the ailment.

NERVOUS AILMENTS.

With reference to other sources of "giddiness," it may be well to point out that brain conditions themselves, apart from ear troubles, may be responsible for this symptom. The only practical fashion of dealing with such an ailment is first to discover the exact cause by seeing if we can exclude from the list of possible origins the liver or stomach troubles to which allusion has already been made. Many nervous ailments are marked by giddiness, and when they are of simple

character they may be relieved by change of air to a mild resort, and by giving twenty grains of bromide of potash in water twice daily between meals—one of the doses might with advantage be given at night. Finally, elderly persons, subject to flushings of the face—and especially stoutly-built people—should be extremely careful of their health if giddiness troubles them. They should attend to the regular action of the bowels, and avoid stimulants and rich foods. They should live quietly and avoid excitement, and in this way they may prevent what may occur in such subjects—namely, a stroke of apoplexy, such as was alluded to in our last article in connection with loss of speech.

HEADACHE.

SYMPTOMS.

For a day or two preceding an attack there may be vague feelings of poorliness, such as languor, fatigue, stomach pains, and even an unusually hearty appetite. After it has passed, the patient may remain perfectly well for several weeks or months, but, not unfrequently lengthened intervals of freedom are followed by increasingly severe attacks.

ONSET.

Pain may be felt for the first time on awakening, or if it begin in the daytime it is immediately preceded by chilliness, yawning, sneezing, and sight disturbances. Floating before the eyes are cobwebby filaments, balls of fire, or brilliantly colored zig-zags (the Rembrandtesque fortifications), whilst the sight itself is dimmed. This dimness is usually partial and in each eye, and often involves the central portion of objects looked at; sometimes only the half of objects can be seen, and then we have one of the most interesting forms of partial loss of sight, to which the name hemianopsia is given. Owing to this, we may only see the upper, the lower, the outer, or the inner half of what we look at, and on the particular variation depends the more elaborate analysis of the process that is in operation.

THE PAIN.

This usually begins on the left half of the forehead, but may occur at the back or the side of the head. At first it is but a dull ache, but quickly it assumes a boring or throbbing character, of a most intolerable kind. It may spread over the whole head, and in typical cases there is a tender spot on the upper eyebrow, near to the bridge of the nose.

THE SICKNESS.

Appetite is lost, and digestion interfered with. At its height the mouth fills with saliva, and vomiting occurs. This increases the pain, and, finally, after a variable interval, the patient falls asleep, or becomes drowsy and the attack ends.

SENSATION.

Ordinary sensation is much disturbed. Some parts are cold, others hot; the scalp is exquisitely tender, one-half of the tongue and one side of the body may be numb, whilst the hands may be unable to hold things because of the numbness.

UNUSUAL FORMS.

The onset, development and duration of the paroxysms may vary greatly, so

that great care is necessary in order to discriminate between what are varieties of sick-headache and many other diseases in which the symptoms of sick-headache are present.

GOUT v. MIGRAINE.

Bearing in mind the family relationship between these two, it can readily be understood that genuine gout in an individual who has been a frequent sufferer from migraine, may now and then be mistaken for the latter when the migrainous symptoms are alone conspicuous; we have, then, what the older physicians called "masked gout," that is, gout wearing the mask of another disease.

"MASKED" DISEASES.

Similarly, neuralgia of the fifth nerve may cause error, but this is not so serious as when the head pain and vomiting due to disease of the brain, such as a slowly developing apoplexy, are supposed to be caused by the migraine from which the patient may have frequently suffered. Fortunately this mistake is quickly perceived.

TREATMENT OF MIGRAINE.

Theories of the treatment of migraine are as diverse as are the explanations given of its causes. Plainly enough, however, they must all resolve themselves into measures taken to prevent its occurrence, and those required during an attack.

CURATIVE.

Sometimes the attack is ushered in with extreme pallor, which is followed by signs of congestion; at other times this process is reversed. In the former case, nitroglycerine, in tabloids containing each one-hundredth of a grain, or nitrate of amyl inhalations have been used with conspicuous success. The latter can only be safely administered by a doctor, but those who have once used the former, may prudently do so again on their own responsibility. On the same principles the inhalation of nitrous oxide gas might be expected to cut short the attack that commences with signs of congestion. If we are committed to one particular line of treatment, especially when the patient is a woman, probably the following is the most generally serviceable. Five grains each of antipyrin and bromide of ammonium, with thirty drops of the liquid extract of ergot, in an ounce of camphor water. This may be taken every four hours. Where sleep is urgently needed, the following is safe: Butylchloral hydrate, two and one-half grains; glycerine and rectified spirits, twenty drops of each in an ounce of water may be taken every hour for six or eight doses. A recent suggestion is citrophen in fifteen grain doses every four hours till three doses have been taken, and it has been recommended that aspirin or salicylate of soda should be added to this.

FOR THE SICKNESS.

The cold pack to the stomach is often very beneficial, and when no food can be taken, drop doses of Fowler's solution of arsenic, taken in a teaspoonful of milk, every four hours, tends to allay the nausea and to bring back the appetite.

GENERAL MEASURES.

In addition, the intolerance of light demands darkening of the room, and the extreme nervous irritability calls for quietude. Mustard may be applied to the nape of the neck, and hot water bottles to the feet, whilst, in some cases, the pres-

Devil's Slide in Weber's Canyon, said by geologists to be one of the oldest portions of the western hemisphere.

sure of an elastic band round the forehead is very comforting.

PREVENTION.

Exercise in the open air is of great importance, for vitiated air favors the onset of the disease. More than all, we must seek to arrive at a clear comprehension of the causes that predispose to its occurrence. Overwork, anxiety, insomnia; abnormal conditions of sight, and diseased states of the mouth and nose, together with the various conditions that lead to alteration in the quality of the blood, such as arise in gout, kidney disease, alcoholism, indigestion and such like, must all receive attention, and, where possible, should be removed or, at least, mitigated.

MIGRAINE, EPILEPSY, AND ASTHMA.

There is sometimes found a remarkably close relationship between migraine and epilepsy. One member of a family may suffer from epilepsy, another from migraine, or an attack of the latter may precede an attack of the former in the same individual. In some families, examples of all three are to be found, whilst, in others, the males may suffer from neuralgias, like sciatica, and the women, from neuroses such as we have mentioned.

THE "SISTER OF GOUT."

"Gout and megrim are sisters," was a favorite expression of Trousseau, the distinguished French physician, and, certainly, if family resemblances and natural history count for anything, he had good reason for the aphorism.

BLOOD POISONS.

Gout is a blood poison, but there are other forms of poison which we manufacture for ourselves, and yet others which we can procure from without. Of the former, we need only refer to that condition of imperfectly purified blood, which occurs in the course of Bright's Disease: of the latter, the inhalation of impure air and the ingestion of foods and drinks that are unsuitable. More, perhaps, than any of these, should be noticed those changes in the general condition of the body which are more conspicuously seen amongst women than amongst men.

SEX, INHERITANCE.

This latter, in some measure, explains the greater frequency of migraine amongst women, and has led to the statement, that, when it does not occur before twenty-five years of age, it is not likely to appear afterwards, and that it frequently disappears altogether after fifty. This must not be too rigidly accepted, any more than the other idea, that when it disappears about mid-age its place is taken by genuine attacks of gout. All that can be safely said is that these phenomena of disappearance, onset, and substitution are often observed. It has been suggested that migraine is mainly a disease of women, because they are more liable to neuroses (or functional nerve disturbances), whilst men are more apt to suffer from neurites (or actual inflammation of nerves). Thus the woman has her migraine whilst the man is maddened by his sciatica.

Inheritance plays a great part in its production, and it has been said that the sufferer is more indebted to her mother

than to her father for her undesirable predisposition to migraine. Be that as it may, migraine is inherited, and women chiefly inherit it.

EXHAUSTION.

The occurrence of migraine is often decided by conditions dependent on exhaustion of the body, brain, or mind, and in this way we account for its occurrence after prolonged loss of sleep, mental anxiety, indigestion, and purely physical fatigue.

REFLEX CAUSES.

When there has been disease of organs distant from the brain, headaches are of frequent occurrence, but we are unable to explain why in one case an ordinary, and in another, a sick-headache may be thus produced.

EPITOME OF ITS CAUSES.

These may be thus stated.—Psychical, as insomnia and anxiety; visual, especially where the sight is abnormal, as in astigmatism; irritation of nerve endings, caused by adenoids, enlarged tonsils, nose diseases, and decayed teeth; toxic, or poisonous, as in constipation (and sometimes from the means used to cure that condition), kidney diseases, and those others already mentioned.

THE FIFTH NERVE.

This nerve sends branches to the coverings of the brain, and all ordinary sensation in the brain is conveyed by it; it originates within the brain itself, and the site of the development of migraine is by some supposed to be at the nucleus of this nerve.

THE ASSOCIATED SICKNESS.

The best explanation we have of this, is the theory of Eulenberg, that it arises from variations in the blood pressure within the skull itself, because of the disturbance of the functions of the Sympathetic System of Nerves of the corresponding side of the body.

WOUNDS.

Let even a slight wound occur whereby the continuity of the skin's surface is broken, and we find the opportunity given for microbes to enter into the citadel of life. It is here as if a small breach was made in the fortification, such as might admit in time a whole attacking army. Something of this kind actually occurs in a certain class of wounds, as we shall see. To illustrate this all important point more clearly, let me take the case of the germ of that terrible disease known as lockjaw or tetanus. These germs live everywhere in the earth. There is not a sample of garden soil anywhere which would not yield them. Now if these microbes were applied to the healthy unbroken skin they could do us no harm. If they could, cases of lockjaw would be very numerous indeed. But let them gain entrance to the body through a scratch ever so trifling and we run a very certain risk of being attacked by lockjaw.

INFECTION BY MICROBES.

Of other microbes which cause illness, especially in connection with wounds, the same remarks hold good. We are safe enough if the skin-surface is intact. When, however, wounding occurs, it is through infection of our bodies by microbes gaining an entrance by the skin

that we get serious consequences, often arising from what may be in themselves trifling injuries. A simple wound, properly treated, heals readily enough. Its edges, brought together, unite without undue inflammation. They heal by a process called by surgeons "first intention." This is the natural process of repair, and it occurs where a wound is kept clean. Suppose, however, some matter or other—"dirt," to use the general term—gains admission to a wound, then we find microbes present as elements in the undesirable material. What happens in this case is clear enough. In place of healing steadily and easily, the wound gets "angry"; suppuration, or the formation of "matter" (or pus) occurs; healing is delayed, and the wound only heals by a long and tedious process. If it is a more serious case of "dirt" infection, blood-poisoning may result.

The practical lesson, then, is that where a wound exists our first duty, after the arrest of any bleeding, is to see that it is properly cleansed. If it is a poisoned wound the bleeding will remove the poison; but we should also suck the wound to remove from it as much of the deleterious matter as possible. If the mouth has no abrasions in it the poison will do us no harm, while the mouth can be washed out afterwards with a solution made by dissolving a few crystals of permanganate of potash in a tumblerful of tepid water. A ligature or strap may be tied between the wound and the rest of the body to prevent the spread of the poison; then the doctor will do what more is required in the way of cauterizing the wound or of similarly treating it.

CLEANSING THE WOUND.

The ordinary wound has to be carefully treated, so as to cleanse it from all extraneous matter after stoppage of bleeding. The best fashion of effecting this end is to boil water, so as to sterilize it, and then use it tepid to thoroughly flush the wound. To the water may be added a little permanganate of potash, so as to color it of a light claret tint. In many cases a little carbolic acid (in the proportion of one to twenty of water strength) may be used as a lotion of disinfecting character after the flushing has been effected. Boracic acid is also another favorite application — about eighteen grains to the ounce of water makes a good lotion. The most powerful disinfectant is perchloride of mercury. One tabloid dissolved in a pint of water makes one of the best applications to wounds by way of disinfecting them. This last solution, however, is poisonous if swallowed, and must, therefore, be carefully kept away from any chance of being taken by mistake. For dressing the wound carbolic oil is one of the simplest applications, used on lint, and afterwards iodoform gauze may be applied over all as an additional protection against germ infection.

STOMACH TROUBLES.

HEARTBURN, COLIC, NAUSEA, AND OTHER AILMENTS.

Among the common trials of the stomach we have first of all to reckon with certain conditions which, while not in themselves of dangerous character, nevertheless represent troublesome enough disorders. That is such states as are indicated

by the terms acidity, flatulence, stomach-pain, water brash, and the like. Now it is quite true that all these symptoms may be present in "indigestion," and may, indeed, characterize that ailment in a very marked degree, so that we come to look upon them as the distinctive features of the trouble in question. But, on the other hand, we may find one or more of them represented in serious stomach disease; and so it becomes necessary for us to note the possibility of comparing the symptoms when they indicate merely a passing disturbance of health with other conditions which demand prompt medical care and advice.

PAIN IN THE STOMACH.

Take as an illustration the symptom of pain. Referred to the stomach pain may indicate in one phase the presence of colic or difficult digestion, eased by simple remedies. In another aspect pain may be a warning to us that something is organically wrong, and that our instant attention is needed by way of averting serious consequences. What we have to bethink ourselves of here are the character of the pain, its frequency, when it comes on with reference to the taking of food, and its association with sickness, which may relieve it or not. We may select as a telling example of the value of recognizing pain in the stomach and its nature the case of what is known as "ulcer of the stomach," or gastric ulcer, as physicians term it. In an acute case we find the pain to come on with regularity about a quarter of an hour or so after food has been taken. It is a sharp, lancinating pain, increasing in severity in each attack, and becoming worse when pressure is made over a special part or region of the stomach. The pain is caused by the movements of the stomach, which, of course, begin when food enters the organ. The ulcer or sore in the lining membrane of the stomach represents a result of inflammation, and it can be understood that the movements, unfelt in a healthy person, will give rise to much suffering when they take place in and affect a damaged portion or area.

ULCEROUS CONDITIONS.

Note next here the effect of vomiting. When the stomach is emptied the pain ceases. The movements of the organ cease, the ulcerated part is no longer stretched and disturbed, and relief is obtained. In the vomited matters blood may appear. If this latter symptom is a marked one the case must be regarded as highly serious. Summing up this first statement regarding stomach pain, it is clear that if any person suffers from severe continued pain just after food, relieved by vomiting, and with the symptom present of blood in the rejected matters, we are most likely face to face not with simple indigestion, but with a very serious condition, for the cure of which the doctor's services are necessary. We may add that ulcer of the stomach is very typical in women, and in anæmic and poorly fed subjects.

NAUSEA.

Turn now to pain of a different kind. The case of an otherwise healthy person, who, having eaten something indigestible, is troubled some time after a meal with sharp pain, is easily made out as a rule to be due to indigestion pure and simple. His pain is of the colicky description; it

is relieved by pressure, and it disappears when the stomach is emptied by vomiting being induced. This last, indeed, is often the surest and quickest fashion of getting relief when indigestion of temporary nature is present. Mothers should bear this fact in mind in the case of children who have been partaking of improper food. A dose of ipecacuanha wine or powder, inducing vomiting, cuts short the whole array of symptoms and clears the stomach of the food, which otherwise will give trouble so long as digestion makes its endeavor to overcome the difficulty. Where "flatulence" is present we again meet with pain, which comes and goes, and which may affect not the stomach alone, but also the bowel itself when this latter portion of the digestive system comes into play. Here also the pain is not continuous, but is of sharp, intermittent kind. Occasionally diarrhœa may be represented, or more frequently there is constipation.

REMEDIES.

Both conditions demand attention, of course, but for the cure of such symptoms, and especially if the pain returns at intervals, nothing is better than the placing on the tongue of twenty grains of carbonate of bismuth an hour before food (i. e., when the stomach is empty) and swallowing the powder with a draught of water. This may be repeated twice or thrice daily if needed with good effect. Sometimes a draught consisting of light magnesia, half a drachm; bicarbonate of soda, twenty grains; half a drachm of tincture of orange peel, and one ounce of peppermint water will give great relief. It should be taken half an hour before meals, or if taken, say, between meals, it may relieve the flatulence and pain coming on later in the digestive work.

HEARTBURN.

"Heartburn," which, as everyone knows, is an annoying condition connected with indigestion, and characterized, as its name indicates, by a burning feeling in the stomach, may be regarded as essentially due most frequently to some over-acid state of the gastric juice. Here there is usually to be found some error in diet which has upset the digestive functions. Salt meats, for example, will readily produce "heartburn" in many persons. Sugar and pastry will give rise to it in others. Chemists tell us that such fats give rise to certain acids which, undergoing changes in the stomach, irritate it exceedingly. This hint may be of service to those of my readers who are fond of baked dishes. They should try other modes of cooking meats. Tea and coffee also are apt to produce acidity if taken after or with meats. "High teas" are to be condemned for the reason that tea and coffee retard and slow digestion and give rise to acid products.

ACIDITY.

The worst feature of acidity is that people, in place of discovering the real cause of their ailment, to be found in the food for the most part, will insist on swallowing day after day large quantities of bicarbonate of soda, by way of correcting the acid condition. This gives temporary relief, but of course the acidity returns with the next meal, and the practice of taking soda in unlimited quantities, and very frequently, is one not unattended by danger. Grave stomach and bowel troubles are often set up through this practice.

and it is the opinion of some physicians that in women who are liable otherwise to the development of gastric ulcer, soda thus used favors the onset of that disease.

Digestion begins in the mouth. There the saliva or "water" of the mouth changes the starches we eat (in the shape of bread, potatoes, rice, etc.) into a sugar. We see that if this action is not perfectly performed, and the food thoroughly chewed and mixed with the saliva, the stomach will receive unchanged starch over which it has no power of digestion. True it is that the stomach does not deal with sugar either, but nature at least teaches us that starch should descend as sugar to the organ and not as starch pure and simple. Many a case of indigestion arises from defective teeth preventing the due mastication of food. The stomach can only act properly on food presented to it in a finely divided form. We increase its labor and delay its work when we "bolt" our food, so that in this first piece of information we may receive a valuable hint regarding one cause of digestive trouble, and a clear mode of preventing it.

DIGESTIVE WORK OF THE STOMACH.

The only foods over which the stomach exercises digestive power are those which we term "nitrogenous" substances. They are the foods which go to build up our tissues, and constitute the foundation of the blood itself, of muscle, brain, and all other living parts. These foods are represented by white of egg, by the albumen or juice of meat, by casein or the curd of milk, by the gluten of flour and by like substances. They are the special objects of the stomach's work. It pours out its gastric juice on them and converts them into a form in which they are quickly absorbed into the blood and placed at the disposal of the body. The stomach is a half-way house on the digestive journey. The food is detained in it till such time as all the nitrogenous elements have been changed and absorbed. What is left unaltered and unchanged by the stomach's work are fats and sugars, and any starches which have not been changed into sugar in the mouth. These wait digestion further on in the bowel.

WATER AND MINERAL SUBSTANCES.

We now see what is meant by saying that the stomach does not perform a large share of the digestive duty; for the great bulk of our daily food consists not of nitrogenous things, but of starch, sugar, and fat. We are taking no account here of water, of which we consume much (in one shape or another) every day, or of the minerals (such as common salt, potash, and the like) of which last we require about an ounce per day. When the stomach itself is at fault, the ailments from which we suffer may be due to a variety of causes. There may, first of all, be some actual disease of the organ itself. Thus we get ulceration of the stomach, or dilatation—that is, great enlargement—or even cancer. In the second place, we may find the stomach's working to be thrown out of gear without any actual changes in its structure. Painful digestion, or weak digestion, may arise from a want of tone in the organ, or from deficiency in either the quality or quantity of the gastric juice which the stomach pours on the food, by way of digesting the nitrogenous foods.

SPECIAL REMEDIES.

Then we find a whole array of symptoms of such disorders in the shape of flatulence, acidity, and water-brash—this last consisting in the bringing up into the mouth of quantities of a watery, tasteless fluid. The practical advice, which may be borne in mind as applicable to ordinary stomach derangement, is that of first ascertaining the nature of the special ailment represented. Meanwhile, two or three hints may be given from the general point of view taken in this paper. Where indigestion is present, let the food be rigidly supervised. All indigestible matters should be avoided—salt meats, cheese, pickles, pastry, and the like—and it will be well, if the stomach be given a rest. Try abstinence from all food, save, perhaps, a little milk and bread, for twenty-four hours, and note the result. This "starvation" process often cures simple cases of irritable stomach, and it may be supplemented by the sipping of a tumblerful of hot (not tepid) water night and morning. Then, when returning to ordinary diet, begin cautiously, taking only light things at first in the shape of white (boiled) fish, tripe, milk puddings, and the like, and eating stale bread in place of potatoes. Many of us never recognize that the stomach, like the heart, greatly benefits from rest. The heart-trouble is cured by rest in bed, that of the stomach by abstention from ordinary, and especially from solid, food for a time.

REDUCING ONE'S WEIGHT.

There is an idea that if the stout person can suffer himself to live on dry foods, taking from six to twelve ounces of fluid only at each meal (and no fluid between)—that is about three-quarters of a pint—if he avoids all soups and fluid foods and abstains from fat, starch, and sugar (leaving his diet to be thus largely one of meat), he will reduce weight quickly. The French doctor who recommended this plan also advocated plenty of exercise and the taking of a purgative frequently. This mode of treatment is far too rigorous for ordinary people. It somewhat resembles the Salisbury system, which consists in giving nothing but beefsteak and hot water, only that no water is allowed in the French system. The danger of the Salisbury plan is that it is apt to throw too much work on the kidneys, and it is pointed out that as no vegetables are allowed for the first fourteen days, serious results are apt to be induced.

A SPECIAL DIET.

For breakfast (at 9 a. m.) he had five or six ounces of animal food (no pork or veal), a biscuit, or one ounce of dry toast and a large cup of tea or coffee, no milk or sugar being allowed. For dinner (at 2 o'clock) he was given fish or meat five to six ounces, green vegetables, and one ounce of dry toast. Cooked fruit was allowed unsweetened, and he drank ten ounces of claret or sherry. The meats tabooed were pork and veal, and no salmon, eels, or herrings were given because these fishes contain much oil. At 6 p. m. he had tea, which consisted of two or three ounces of cooked fruit with a rusk, and nine ounces of unsweetened tea. Supper at 9 p. m., consisted of meat or fish (as given at dinner) three to four ounces, and seven ounces of claret or sherry and water. Here from twenty-one to twenty-seven ounces of solid food were

given each day, only two ounces of bread being included, and from thirteen to sixteen of animal food, the balance being made up of vegetables and fruit. His fluid amounted to thirty-five ounces, or one and three-quarter pints.

A NOTED SYSTEM.

In Ebstein's system more fat is allowed. Breakfast (6 to 7:30 a. m.) consists of one and three-quarter ounces of white bread toasted, and well buttered, with nine ounces of tea without milk and sugar. At dinner (2 p. m.) the patient gets fat soup made from beef marrow, and fat meat (four to five ounces), with such vegetables as spinach, cabbage, asparagus, and even peas and beans. Stewed fruit (no sugar) is allowed, and the drink is represented by two or three glasses of light white wine, with a large cup of tea after dinner, without milk and sugar. At 7:30 supper, which consists of an egg, an ounce each of bread and butter, or, in its place, fat ham or roast meat, or cheese with fresh fruit. A large cup of tea is also ordered as before. Here the fat serves to reconcile the patient to the diminution of starch and sugar, and also tends to limit the craving for fluids. These illustrations will serve to show forth the principles on which a fat cure may be conducted.

CONSTIPATION.

This ailment is a very serious one in our present civilization. It affects all ranks and conditions of life, and if one has to deal with the question of sex, one might without fear of contradiction, declare its greater frequency in women than in men. The effects of constipation are of very far-reaching kind. There is scarcely an organ of the body, from the brain to the skin, on which it may not exercise an influence, and that, of course, to the greater or less disturbance of the health. Take, for example, the case where a person complains of a headache, with a foul tongue, a disordered appetite, and possessing a badly colored, sallow skin, the chances are that in such a case we will find constipation at the root of such troubles. They may arise from other causes, but the ailment we are considering is by far the most likely source and origin of them.

REGULATION OF THE LIVER.

These are not the only symptoms which constipation is calculated to produce. Many cases of supposed liver disturbance are really due to constipation, and the liver in its turn may induce constipation when the secretion of bile is deficient; for when bile passes, as it ought naturally to do, into the intestine, to assist in digesting the fatty materials in the food, it stimulates the movements of the bowel; when, on the other hand, the quantity or quality of the bile is altered, the intestinal movements become sluggish, and a constipated condition is produced. But the two great causes of this ailment—there are others—are, first, want of exercise, a too sedentary life, and, second, the use of improper foods—that is, foods unsuitable for easy digestion. Among other causes which may be named let me include tight-lacing, and physicians are right when they lay

at the door of this condition so many of the cases they see in the female sex. It cannot be otherwise than injurious to the digestive work to find the stomach and other organs displaced and interfered with mechanically in the discharge of their duties.

EASY REMEDIES.

Women should keep this latter point in view if they suffer from this trouble, and in their case, as also in that of many men, a sedentary life, and a tendency to rich feeding and over-feeding, are to be also reckoned with in the production of the diseased state. If a person taking little or no exercise would go for a short and brisk walk regularly every night and morning only, he might experience a change in the character of his trouble. If a tumblerful of cold water is taken on rising it might, in addition to the walk, produce an excellent effect—so many cases can be cured by simple means, if only people will take a little trouble with the cure, and what is more to the point, will persevere with it. Rome was not built in a day, and constipation cannot be cured in twenty-four hours. It represents a habit, an evil habit, into which the digestive organs have fallen, and what we really have to do is to replace this habit by another, the natural and healthy one.

PROPER FOOD.

Next as to errors in diet. As a rule a diet which is dry to excess will induce this ailment, hence it is of importance that a fair amount of fluid should be included in the food arrangement. So also, particular food will tend to cause and increase the trouble. Cheese, salt foods, pickles, pastry, and rich foods at large are all to be looked on with suspicion. Far better are farinaceous foods, oatmeal, oat flour, and the like, light puddings, tripe, and easily digested articles at large, with wholemeal bread in place of the ordinary article. Fruits are excellent. Apples and oranges may be freely taken; prunes are good, and grapes also, only the skins must be avoided. A Spanish onion well boiled and taken at night is most excellent; onions or leeks, stewed, may form a dinner vegetable; while salads are valuable, especially when taken with oil. With regard to other habits, no doubt tobacco has an action on the bowels in many cases, and the morning pipe or cigar is not to be eschewed, but valued, on this account. A simple diet, with no excess of meat, aided by the use of wholemeal bread, fruits, vegetables, and farinaceous foods, will cure any ordinary case, care being taken in the matter of exercise. Nor must there be any over-eating. Excess can only clog the digestive system, and render it less likely to discharge its duties in an efficient fashion.

DRUGS.

Next, as to drugs. Beware above all things of crude purgative medicines, and assuredly know that such medicines as salts and the like will only make your trouble worse. The indiscriminate swallowing of pills and potions is to be similarly criticised. You begin with one or two pills; this dose soon loses its effect; the dose is doubled, then quadrupled, and so the mischief grows. Drugs, let it be understood, may begin and will aid a cure—they are never to be regarded as the chief means of obtaining relief. Cascara is a well-known and safe remedy. Take

Photographic view of Excelsior Geyser, Yellowstone Valley, Wyoming. This is the greatest in volume of any geyser in the world.

two tabloids of this substance at night, either plain tabloids or those in which cascara is combined with other drugs, and follow the dose in the morning with a tumblerful of cold water if need be, or the liquid extract of cascara itself may be taken in water, a teaspoonful for a dose. This remedy (along with proper diet) may be persisted in for some time, as it has no cumulative effects. A mixture of two ounces of liquid cascara extract, three drachms of belladonna tincture, three drachms of tincture of nux vomica, and glycerine up to four ounces, is an excellent remedy. The dose is a small teaspoonful in water at night. A pill containing half a grain of extract of aloes, half a grain of nux vomica extract, half a grain of powdered ipecacuanha, and one grain of powdered capsicum, is also an excellent remedy, and may be taken once daily before dinner, cold water being taken in the morning or a dose of any apperient water.

VARICOSE VEINS.

There are a number of definite causes, however, which tend toward the production of varicose veins, and we must give consideration to these causes by warning ourselves in the matter of prevention. In the first instance, certain cases of heart weakness will cause an obstruction to the free return of blood, and thus produce varicose veins. The wearing of garters by women is another and very fertile source of this affection, and physicians add to this remark that a tight-laced woman, by reason of the extreme pressure of her corsets on the liver, will be apt to develop this trouble. Occasionally in pregnancy varicose veins are met with, but this condition disappears after childbirth as a rule. Constipation is another and very common cause. Pressure on the veins within the body of a loaded intestine is certain to develop varicose veins in people who are much on their feet, and piles (which, in one sense, are only varicose and enlarged veins) form another result of want of attention to the functions of the bowels. We, therefore, see that where from one cause or another—ranging from heart trouble or some local condition of veins, to excessive standing, constipation, and garters—the flow of blood upwards in the big veins is obstructed, we are liable to meet with the varicose condition.

Many variations exist in the development of this state. There may be only one or two veins enlarged, or in a bad case we may find all the veins on the leg surface swollen and distended, and appearing as it has been described, "like a bag of big worms." The patient complains of pain, often worst at night; the leg is apt to swell, and the skin over the veins in due course becomes affected. It is inflamed, liable to suffer quickly from any injury, such as a knock or blow, and in cases where such an injury has affected a well-marked case, a sore or ulcer may form, which is apt to open into the vein. Now, in such a case, we get a varicose ulcer, which, of course, bleeds slowly but profusely. Many persons are found lying faint from this cause, and death may result from loss of blood. If any such accident happens, bandage the leg above and

below the wound; for as the valves of the vein (which prevent return of blood when they are healthy) are damaged, blood not merely flows up from below, but from above also. Remember this piece of advice, because it is of important nature, and may mean the saving of a life.

Regarding the treatment of varicose veins, there must first be some cure or relaxation of the conditions (constipation and the like) which tend to produce them. The patient should be less on his feet, and when he rests he should keep his feet elevated. The mattress of the bed should be raised at the foot, so as to favor a return of the blood. An elastic bandage—preferable to a stocking—should be worn. It should be put on first of all by an expert, so that the patient may be taught its proper application, for a badly-applied bandage or a badly-fitting stocking will only make matters worse. Sometimes the bandage is worn with advantage over an ordinary thin stocking. It should be removed at night. Guard against constipation, I repeat, remove all garters, and (in the case of women) see that tight lacing is avoided. A plan of treatment once in vogue was that of blistering the veins. This can only be carried out by a physician. In bad cases surgeons undertake operations for the ligature of veins or for the removal of the enlarged vessels. The circulation is carried on in such cases by the deeper veins, which are not affected. Bathing the veins at night after the removal of the elastic bandage with warm water, to which a little hazeline is added, is beneficial, by way of preventing undue tenderness of the skin.

CAUSE AND CURE OF HAY FEVER.

Science has at last discovered the sneeze germ. It is the tiniest imaginable particle of poison hidden away in the heart of the pollen grains of grasses and certain other plants. When one of these little grains gets into the nasal passages, it is partly dissolved, and the poison, absorbed by the mucous membrane, sets up a violent irritation. As a result, the victim suffers and, if naturally disposed to the complaint, pretty nearly sneezes his or her head off.

That the pollen of plants was accountable for the disease called hay fever, which makes so much trouble, has long been known. An American named Dunbar, who is director of the hygienic institute of Hamburg, ascertained the reason why these minute yellow grains, which are produced in the anthers of flowers to fertilize other blossoms, work such harm to many human beings. More important even than this, he has obtained a serum which, when people are treated with it by inoculation, renders them proof against the complaint.

PHYSICIANS WORST SUFFERERS.

The poison seems to be of an albuminous nature. It belongs to a class of poisonous substances known to chemists as "toxalbumins," the presence of which in certain species of mushrooms renders them so deadly. Fortunately most human beings are not affected by it, but those whom it picks out as its victims often suffer frightfully. Physicians for some unknown reasons, are the worst sufferers.

something like ten per cent of them being attacked. Women who travel much or who practice vocal or instrumental music, are particularly liable to hay fever. But, strangely enough, the disease is limited almost entirely to the educated classes.

The pollen grains, which at the time of year when the grasses are ripening float about in the air everywhere, may fly up the nostrils; or they may enter the eye, and the poison, being dissolved by the tears, makes its way from the eye through the tearduct into the nasal passages and the pharynx. An irritation is promptly started, and violent sneezing follows, all of the membranous surfaces, including those of the eyes, becoming congested. In bad cases the victim is wholly disabled.

Now, Dr. Dunbar has found that he can produce just such an attack artificially in a person liable to the disease by injecting beneath the skin a solution of the poison in water. Even in winter the familiar symptoms promptly follow. But individuals who are immune to the complaint under ordinary circumstances can not be made in this way to develop hay fever. An interesting point worth mentioning in this connection is that the poison seems to be the same in all the grasses, and also in the pollen of certain other plants, such as golden rod and rag weed, which are makers of hay fever. The golden rod is a somewhat notorious offender in this line.

METHOD OF OBTAINING SERUM.

By inoculating a calf with numerous doses of the poison, Dr. Dunbar, without much inconvenience to the animal, succeeds in introducing into its circulation a considerable quantity of the toxic substance. When this has been accomplished he draws from the animal's veins a few ounces of blood, which is allowed to stand in a closed jar for twenty-four hours, at the end of which the red corpuscles have sunk to the bottom, leaving the watery part of the blood on top. This watery part is the serum which is used in a hypodermic syringe for injection beneath the skin. If, as seems likely from experiments already made, it proves to be an effective cure for hay fever, the discovery may well be regarded as one of the most important in the history of medicine.

From what has already been said, it will be understood why hay fever comes only when the grass is ripe. In the summer of 1902 there was so much wet and rain that the ripening of the grasses was delayed by a fortnight, and it was noticed that the scourge did not arrive until two weeks after the customary date. Many people take sea voyages, or go to the White mountains for the purpose of escaping the attacks which they have so much reason to dread, but it is very difficult to get away from hay fever, owing to the traveling propensity of pollen, which, its particles being microscopic, is sometimes wafted hundreds of miles through the air. Showers of it occasionaliy fall on shipboard long distances out at sea.

POLLEN IN CEREAL GRAINS.

The cereal grains, such as rye and wheat, are grasses, and their pollen shares in the accountability for hay fever. Viewed under a magnifying glass, the tiny flowers of six grasses, which resemble lilies in their structure, are very beautiful. As for the pollen, that which pertains to each species of plant is unlike

that of any other plant. Indeed, by examining any bit of honey one can ascertain, with the aid of a microscope, just what kinds of blossoms were rifled of their sweets by the bees to make it.

All of us sneeze now and then, whether we have hay fever or not, but to few people has it ever occurred to inquire what a sneeze really is. Something irritates certain nerve ends in the lining of the nasal passages, and the result is a spasm. There is a sudden closing of all the passages by which air may be expelled from the lungs, in preparation for which a sudden breath is taken. A violent contraction of the diaphragm and other muscles follows. Then the throat and nose are opened and a vigorous expulsion of air occurs.

HYSTERIA.

Many affections attack both sexes with seeming impartiality, but hysteria is undoubtedly much more commonly met with in young girls and women than in boys and men, although the latter are by no means free from the complaint, especially those of Latin extractions—e. g., Italians, etc.

Of the causes tending to produce it two are very important—namely, heredity and the patient's bringing-up when quite young. A person may inherit from his or her parents an abnormally sensitive disposition, and, again parents often fail to exercise a sufficient amount of control over their children, giving way to them too often, satisfying all their wishes, even when not for their good, and sympathizing too deeply over every little trouble, real or purely imaginary.

The result of this is that many children grow up with an absolute ignorance of self-control; they are unaccustomed to have any of their desires thwarted, and so are quite unfitted to take their proper place when later on they are brought face to face with all the cares and worries of everyday life.

Between the years of eleven and sixteen or seventeen, just at the time when the future development of the body, both among boys and girls, is in its most important stage, a large number are often too closely confined in the schoolroom and also at home, working for examinations of one sort or another, and the result is that the physical part of their organization has to suffer in order that the purely mental side shall become more in evidence. Under these different and wrongful conditions hysteria will often supervene.

Among other causes may be mentioned a sudden fright, grief and worries of different kinds, or a disappointment in a love affair.

Hysterical affections and "attacks of nerves" were apparently more common in the days of our great-grandmothers, and this was very likely due to the far more restricted sphere of life in which they moved, for they had no such recreations as cycling, tennis, and other forms of amusement and exercise by which they might add variety to their lives.

THE STRENUOUS LIFE.

But now it is quite a debatable point whether there is not great danger in the strenuous life led by many women both

in the pursuit of pleasure and in their competition with man in many different occupations.

To the untrained eye hysteria may closely resemble an epileptic fit. It may be, and very often is, preceded by alternate attacks of laughing and crying, with a feeling of a lump rising in the throat and causing difficulty of breathing, or there may be pains in other parts of the body. Next the patient falls into more or less violent convulsions, but, unlike an epileptic fit, there is no loud cry with a sudden fall, but rather a sinking down, often carefully, on to the ground or into a chair, and the sufferer, though apparently quite unconscious, seems to take care not to do any injury to himself—or herself, as the case may be—in the struggling.

The arms and head and often the whole of the body are thrown and swayed about in an aimless manner, and then after a few minutes the movements gradually cease and the patient may commence to cry again and then recover consciousness. In a very few cases sufferers may pass into a torpid condition from which there is often great difficulty in rousing them.

TREATMENT.

In the treatment of all cases of hysteria it is essential to remember that it is during the early years that most good may be done, as a "confirmed hysteric" is one of the most difficult and wearisome of people to nurse and watch.

Regularity in hours of work, sleep, food, and exercise and regularity in all the different functions of the body should be absolutely insisted on and carried out.

In other ways each case must be judged by itself, harshness and unjust treatment as well as, on the other hand, too much so-called kindness and sympathy having a great deal to answer for.

The allowing of but a moderate time for study, the giving of some congenial occupation and exercise, gradual at first and then slightly increased as the patient improves in health and spirits, combined with firm moral control, will generally bring about a very great change for the better.

In the more advanced cases the "Weir Mitchell" treatment is of substantial advantage. The most important features of this system are complete isolation from the patient's friends and relations, diet, and rest, with massage and electricity. A medical man should always see and advise as to how far the method should be carried out.

SORE THROATS.

Of all common complaints, to which both old and young are subject, a sore throat, as it is generally called, is certainly one of the most ordinary. But there are many varieties of sore throats, and it may be of interest to deal briefly with those kinds commonly met with. Acute pharyngitis—simple sore throat—often follows after catching cold or after exposure to cold, or it may be constitutional —say in connection with gout or rheumatism. In this case the throat appears to be red and more or less dry, while the tonsils and uvula are often a good deal swollen. The patient, as a rule, endeavors to cough; he has a continual desire to clear the throat, owing to a dry tickling feeling there. A considerable amount of

pain follows the effort to swallow food or drink. There is also some slight rise of temperature and feverish feeling at the onset of the trouble, as well as stiffness of the neck and slight deafness. This kind of sore throat rarely lasts more than a few days, and an aperient of Epsom salts at the commencement, with a few inhalations of steam from a bowl of hot water, and avoidance of cold and drafts, will soon make the patient quite well again. A frequent sequel to this, but attendant generally on neglect in treatment, is the form of chronic pharyngitis that follows several different attacks of the acute form. Among clergymen, costermongers, public speakers, and others who have to strain their voices, as well as among those who smoke or drink to excess, it is very often met with. Here the best advice is to avoid the exciting cause, giving rest to the voice, and abstaining from tobacco and alcohol; gargles and sprays to the throat only give temporary relief.

TONSILITIS.

Acute tonsilitis, or inflammation of the tonsils, is a common form of sore throat among young adults. Wet, cold, and bad sanitary surroundings—bad smells, etc.—are a frequent cause. The attack commences, as a rule, with a chilly feeling, accompanied by pains in the back and limbs, while the temperature is considerably raised, reaching 102 degrees, or higher; there is severe headache and great pain in the throat, more especially on swallowing. On examination, the tongue is seen to be very furred, and the breath is very offensive; the tonsils are red and swollen and have small, creamy-white spots on their surface. As this form of sore throat is very catching and may attack all the inmates of a house, it calls for energetic treatment, isolation of the patient being imperatively demanded. The great danger here is that diphtheria in its early stages may be mistaken for it; therefore, if there is the slightest doubt, a medical man should at once see the patient, especially if the white spots on the tonsils increase in size, connect, or spread to other parts of the throat. The treatment should be as follows—Entire rest in bed, with a milk diet. A thick piece of flannel, wrung out of ice-cold water, placed round the neck, will often give great relief. A dose of Epsom salts should be given, and the throat gargled frequently with a solution of chlorate of potash (eight grains to the ounce of water) added to a little glycerine. Later on, when the inflammation is subsiding, doses of quinine and iron and other tonics should be used, and a more generous diet adopted. A change of air during late convalescence is very beneficial.

A CURE FOR WORRY.

When the symptoms of worry begin to manifest themselves, says the "Family Doctor," loosen your garments completely, and lie down in the most restful position you can assume. Now close your eyes for a few minutes, and, raising your arms, let them fall and lie loosely and naturally above your head. Lie thus for a minute or two, and then begin to take deep, long breaths, as deeply as possible. Keep this up for five minutes, and you will then be in a physical condition to take up the mental work which you need to do.

FOMENTATION.

Fomentation is a simple and effective method of applying moist heat to any part of the body by means of flannel wrung out of boiling water, milk, or any medicated hot fluid. It possesses advantages in many cases, and it is to be preferred to poultices, as it is lighter and cleaner, and can be frequently repeated without much trouble. In extensive inflammations, especially of the abdomen, in erysipelas, and to allay spasms in deep-seated parts, as in cases of biliary calculi, repeated milk fomentations are always to be preferred. When moist heat is prescribed for inflammatory diseases of the joints or as a mild derivative in rheumatic fever, to relieve the articular pain, milk fomentations will be found serviceable. Much depends on the way in which the fomentation is prepared. It ought to be applied as hot as the skin can bear, and, although moist, the hot liquid should be thoroughly squeezed out of the flannel applied to the skin. A large piece of coarse flannel folded is employed for the purpose, and, after being soaked in the boiling liquid, it should be enveloped in a coarse towel, and the hot liquid may be wrung out of the flannel by simply twisting the ends of the towel several times round the fomenting cloth. Have two pieces of flannel and a pail of hot water in which to wash out each cloth before applying it a second time. After the operation well wash out the flannels and hang them in the fresh air (and sunshine if possible) until again required. To protect the hands use a wringer made by fixing a wooden rod to each end of the towel. To retain the heat it is advisable to apply a dry flannel or towel over the wet one. The milk must be sweet and good, also thoroughly boiled. Almost every form of disease will be much relieved and more speedily cured if milk fomentations are applied. Carefully sponge the fomented part with cool water, and use gentle massage after.

MAY CEASE GIVING DRUGS.

Will the doctor of the future instead of prescribing some unpleasant drug, order a course of medicated vegetables? This may be the result of the present attempts to cultivate plants containing abnormal quantities of certain medicinal substances. It is well known that the amount of any characteristic element in a plant varies with its richness in the soil, and it is also known that the assimilation of mineral elements of the body is much more readily accomplished when they are partaken in the form of food. In the past if the body needed an excess of iron it has been supplied by tinctures taken through glass tubes. The modern idea is to supply this want by such vegetables as medicated spinach.

Experiments with plants grown in soil enriched by hydrate of iron proved that they contained a much larger percentage of iron than those grown in the natural soil. This opens a whole vista of interesting possibilities. The iron, the potash, the manganese, the nitrogen needed by the system can be supplied more effectively and more pleasantly through vegetables than through medicines.

Already many vegetables are known to have curative properties. Celery is gen-

erally held to be good for rheumatism and nervous disorders; lettuce for insomnia; peanuts for indigestion; onions for liver complaints; carrots for scurvy; tomatoes for the liver; blackberries for diarrhœa, and apples for nervous, dyspepsia and rheumatism. Certified milk, with its stated proportion of fat, sugar and solids, would have seemed improbable some years ago.

SOUR MILK IS ELIXIR.

BACILLUS OF LACTIC ACID PREYS ON THE ENEMIES TO HEALTH.

Any one desiring to attain a ripe old age is recommended to follow the examples of the Bulgarians, who are noted for their longevity, and who consume large quantities of this cheap and easily obtained beverage.

Sour milk contains a large bacillus, remarkable for the great quantity of lactic acid it is capable of producing.

THIS MICROBE A FIGHTER.

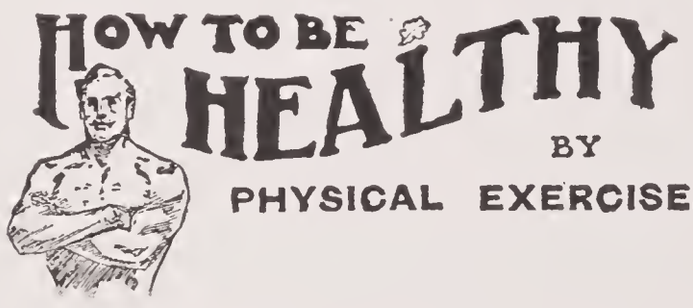
This microbe does not exist normally in the human body, and can be introduced with great benefit to the health, as it preys on the hundreds of thousands of microbes which infest the large intestine.

It has been noted that there is a great similarity between old age and disease. The study of certain diseases has proved that there is no difference between the mechanism of senile atrophy and that of atrophy caused by the microbe on the person.

BATTLE OF THE MICROBES.

In fact, on the approach of old age, a veritable battle is waged in the innermost parts of the body.

Research is therefore being prosecuted to discover some means of strengthening the vital elements of the body on the one hand and to weaken the aggressive tendency of the harmful microbes on the other. Therefore, whatever weakens or kills the harmful microbes accordingly lengthens life, and sour milk is now named by scientists as among the elixirs.



NO. 1—BOWLING AND THROWING.

Imagine a cricket field, green turf below, blue sky above, and yourself the bowler. On the ground, to your right side, put a ping-pong or soft india-rubber ball.

Get the best air and light you can, as little clothing as you can, and, if possible, have your feet bare.

Now, keep your chin in, your back hollow, your eyes facing forward (though at first to insure correctness, you may focus them on the part which is being used).

Keep your mouth shut, not locked.

Do not frown. Rather begin to smile.

Untense your hand. Get rid of all stiff and unnecessary tension. It is sheer waste of energy.

Be leisurely, yet attentive. Do the exercise affectionately; it is your friend and helper.

Now relax the left side, and let it hang easily limp.

Bring your right hand and arm well back and down with your right side, the weight coming upon the right foot, as if you were beginning to bowl. If you like you can precede this with a short run.

Bring right arm back.

Move arm overhead.

Then move your right arm, always at its full extent, up and forward and round, and the shoulder with it, till you end up with the first and middle fingers pointing toward some definite mark on the wall in front of you.

That should leave you with your right arm, right leg, and left leg fully extended.

The weight has now passed well on to the left leg.

Recover.

Get into an alert position, with the weight evenly balanced on the two feet.

Stoop down with your right hand near to your right side, bending your right leg as little as you can; pick up the ball; bring it as far back and down as it will go behind your right ear; then throw it at some spot on the wall, fairly high up, so that it will come back to you as a catch.

Follow the throw well through, as you did the bowling. Then catch the ball as it returns.

Practice this with the right side till it is easy.

Arm extended forward.

Movement ended.

Then practice it with the left side, beginning as slowly as you like, and gradually increasing the extent, the pace, and the number of times.

Three times is almost enough to begin with.

Having trained the right side, you can probably—so recent experiments seem to show—train the left side to do that exercise in a third of the time that it would have taken otherwise.

Then do the exercise with the two sides alternately.

Muir Glacier of Alaska. The number of icebergs given off into the sea by this glacier in sizes that are heard to the distance of a mile, in breaking and falling, average one in about every six minutes.

Then rest, and breathe leisurely and rhythmically through the nostrils.

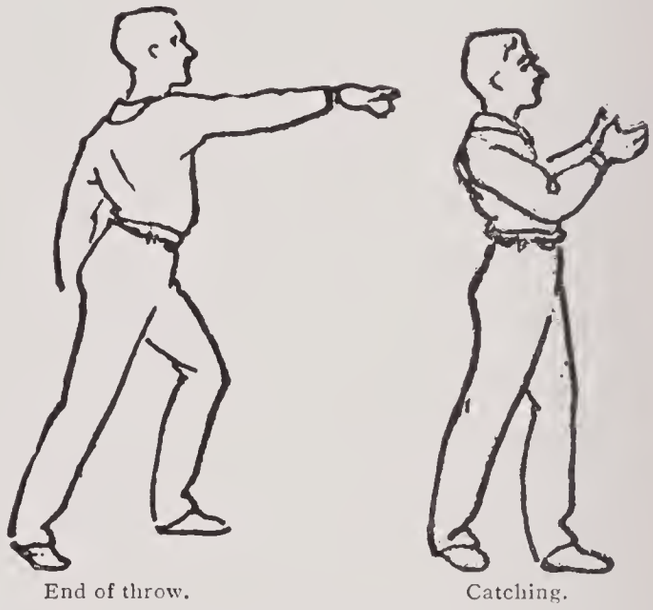
Then, if you like, go through the action as far as you can with the two sides together.

Now have a good wash and rub down, perhaps with a wet towel.

WHY DO THIS EXERCISE?

If practiced carefully, so that you feel the muscles stretch without straining them, and if you gradually increase the extent, the pace, and the number of times it is a good exercise for both sexes, a safe one, a brief one, a cheap one, and a graceful one.

Picking up movement. Throwing action.



End of throw. Catching.

It is interesting because it is like some important movements in our great game. It is more living to Anglo-Saxons than most of the exercises of their drills, and it will help athletics as well as cricket. It will tend to keep people in practice as well as in training.

A sign of bad training is breathlessness. This exercise will encourage training and health. It will improve the breathing, and so help to prevent consumption. It will strengthen the heart and quicken and clear the circulation, so that you will not feel so cold in winter, or so hot in summer. It will aid the digestion—by indigestion you lose a great deal of the value of what you eat.

The appearance will benefit through the general health, which will better the complexion, and by the improved figure and carriage.

Not only will a large number of important muscles be developed, but you will get more independent control of the two sides, and of the arms and legs, and of the poise.

A most important part of control is the art of not using muscles unnecessarily. It corresponds to not spending money unnecessarily. He who frowns or tenses his muscles needlessly, is letting energy slip out like sovereigns from a hole in a pocket.

The power of concentration on a good regular habit increases. The demand on the attention is so short and so small that this makes an admirable beginning on which to build the power of focusing the mind.

HEALTH HINTS.

Save your energy by not worrying, and by not hurrying needlessly.

To worry is a sign of cowardice; it shows you are afraid of something.

It is uneconomical for it wastes nervous force.

It is ugly, for no one ever yet admired the expression of worry. And it has a bad effect not only on the whole system—as science has shown—but also on all the people around.

It is, in fact, a crime.

It is slow murder of yourself and others by poisoning.

Have you found it difficult not to worry? Then at least try not to express worry.

Notice all the expressions of worry and avoid them.

Breathe leisurely and rhythmically.

Keep your hands and most of your muscles relaxed rather than tense.

Once again, notice your eyes; think of the horizon.

Try, as it were, to broaden your face.

Relax your mouth.

Relax your hands.

Take advantage of every outward breath to feel more and more relaxed and leisurely.

NO. 2—A SWIM ON LAND.

You can practice swimming exercises, if you are strong, while you lie on your front waist upon a bench or chair, or you can practice them to some extent as you lie upon your back upon the floor; but, best of all, I think, is an inclined plank, which keeps the excess of blood from your head, and lets you move your shoulders well back.

However, you can do it quite well standing.

Stand with the small of the back reasonably hollow.

Throw the head well back.

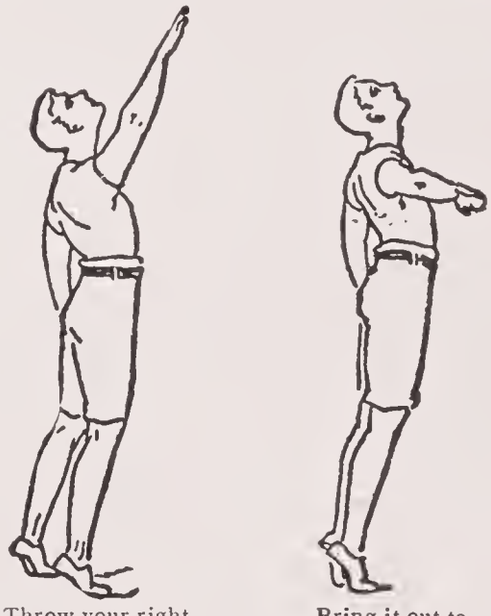
Keep the mouth shut, but not locked.

Breathe quietly through the nostrils.

Do not frown.

If you can stand and exercise before a full-length mirror, so much the better.

Imagine yourself to be in the sea or in a river. Wear as few clothes as possible,



Throw your right arm up. Bring it out to the side.

and try to recall the memory of the fresh and cleansing water.

Keeping your left arm relaxed by your side, send your right arm up and out as far as it will go in front of you, with the palm down. This is the first and the finishing position.

Now, as you say "One," turn the palm outward by turning the thumb downwards, and draw the arm, with its fingers together, slowly back and slightly down till it comes to about the level of the side.

As you say "Two," bend your arm, bring your elbow to your sides, and the back of your hand under your chin.

As you say "Three," stretch the arm forward once again to the first position.

Practice this with the "One, Two, Three," till it becomes quite easy.

Then practice it with the right hand relaxed and the left hand moving.

Be sure that the "One, Two, Three," are connected each with its own movement.

Insist on correctness before speed.

Breathe through the nostrils, and breathe rhythmically at intervals if you are inclined to feel tired.

Now for the leg movements, which are

Beginning of the stroke

and its finish.

far more difficult, yet are far more important.

As you count "One," draw up your right thigh, with the knee far away to the right, and with the leg well bent.

As you count "Two," bring your foot at right angles to your leg.

As you count "Three," stretch the leg backwards and round, and so to the position in which it is extended behind you, the toe pointing as far as it can away from you.

Now do this with the other leg also, making sure that you associate the "One, Two, Three," each with the right movement.

Once again, be correct before you increase the rapidity.

Then move the two arms together while you move first the right leg, then the left.

As a variant, stand on tiptoe and stretch forwards while your arms are out to the front.

Then go through these movements, crouching as you send your arms round.

After you have done this, soap yourself, and use warm water and rubbing; then wash off the soap, and rub yourself vigorously all over with a wet towel, and dry yourself with a rough towel.

You can do it in your bedroom when you get up in the morning and at night before retiring.

If you do it carefully, it will stretch your muscles without straining them. Be sure to increase the extent, the speed, and the number of repetitions, by degrees.

If you do this, it will be a safe exercise, a cheap one, and a graceful one.

Besides, it will be interesting to Anglo-Saxons, for it will resemble the swim, and recall the memory or anticipate the feeling of the swim, with its cleansing and invigorating influence.

Swimming in its various forms, including the side, overhand, and other strokes, and diving, must develop the breathing capacity. It is a fine form of recreation. It may be a means of saving the life of yourself and others.

For this, and many other reasons, it is a road to self-respect.

Whether you practice these movements on land or in the water, they will be a training in poise, they will be practice for swimming itself, and will keep you in training when you have not the facilities for swimming.

By developing your lungs they will help to prevent or cure consumption, from which a rower sometimes suffers when he has given up his rowing.

They will improve the circulation, and so strengthen the heart.

They will improve the digestion, and help to prevent or cure dyspepsia.

The trunk-muscles—you can feel how many of them are being exercised—are among the most vital in the body. Make them healthy, and you will improve the position of the organs of the body.

Thereby you will improve your appearance—your figure as well as your carriage. You will develop muscle, rather than flabby fat. The swimming itself, of course, tends in this direction.

By my special plan, neglected in nearly every orthodox system, you will get independent control of the two sides, in addition to the control and co-ordination of arms and legs, which most systems do cultivate. I have found it extremely difficult to combine the correct swimming movements of arm and leg.

While one side moves, the other side rests, and must not be tense: take particular care about that.

To relax the unemployed side till it is the turn of that side to move will tend toward economy and beauty.

Here, as before, you concentrate and focus your attention on an easy subject, and so increase your will power.

HEALTH HINTS.

On the same principle, do not give up the first practice of not worrying and not expressing worry. Add the second practice to it, if this suits you.

We are tired of the hackneyed phrase: "We all eat too much." Not one out of a hundred people who repeats it troubles to study food values.

It is not merely a matter of bulk, as these people seem to imagine: it is that we take too much of some things which, in small quantities, are right: it is that we take other things which, in large or small quantities, are wrong.

It is also that we take too little of other things.

In advising you to try fewer meals I am absolutely against any starvation principle.

I want you to try fewer meals, but to insure enough nourishment in those fewer meals which you do take.

An ounce of experience is worth a pound or two of theory. I am not going to commend the no-breakfast plan; I am merely quoting a personal experience as to its value. If it does not suit you, give it up. Try it during a holiday, when failure does not matter so much.

At first I ridiculed the idea, having been accustomed to a huge breakfast at school and college, and afterwards. And never yet have I understood the theory satisfactorily, except that the best energy stored up during the night should be used for the best work of the morning.

We know remarkably little about food. It is easy to dogmatize; it is almost impossible to be scientific. The so-called scientists dogmatize without data. Bear in mind, then, that I do not guarantee results; I merely say what has happened in my case. I myself have advanced to the no-breakfast plan by gradual steps.

To rush into the plan may suit some people; but, for the first three or four, or even seven days, there is almost certain

to be an empty and weak feeling about ten or eleven or twelve o'clock.

This is not necessarily healthy hunger; it may be fermentation. Give the plan a trial of nearly, or quite a week, before you condemn it.

The gradual steps towards it vary. On the Continent you get a light and scarcely nourishing breakfast of coffee, roll, and butter. For my own part, I have a cup of tea. The proprietor of a well-known daily paper has fruit. Other people have cocoa, or hot water or milk. But, whatever your steps may be, judge the plan by its results. Do not accept it or condemn it prematurely.

NO. 3—A BIT OF BATTING.

Once again, imagine yourself on good turf.

Now, you are not bowling and fielding, as in the first article of this series but are batting.

Use a stick, or a light Indian club, if you like, rather than a bat, so as to make the stroke free and correct before you try the heavy implement.

Get ready to bat, but use one hand only, at first the left hand, while the right hand and side hang relaxed.

Now imagine someone bowling to you.

Picture a ball to which you will play forward.

Bring your implement straight up and back.

Then lunge out well with the left foot, making it point straight forward, not away to the right, and, with your left leg carrying the weight of your body, stretch out your left elbow and shoulder well and direct to the front, slightly to the right of, but very close to, the left foot.

The back of your left hand at the end of this forward play should face forwards.

Throw your weight and the power of your body into that lunge, but do not let the end of the implement tilt up.

Keep your back reasonably hollow; then recover poise and the alert position.

Next go through the action with your right hand, now keeping your left hand relaxed.

Then reverse the sides, as if you were batting left-handed.

Then go through the ordinary batting

Hold the bat in position. Prepare to make a hit. Go out to meet the ball.

action with both hands together. For the first few times, until you get into the way of the stroke, it might be as well to start with the two sides together.

Next, starting with the alert position again, decide that for the following ball you are going to run out and hit it to the boundary.

Imagine the ball coming. Run out sideways, facing towards the right with your body, but facing forwards with your head; let your right leg be straighter and firmer than your left, which will be bent.

While you are running out, draw your

right arm and shoulder well back and up with the implement in the hand.

Let the left arm hang relaxed. Then sweep the right hand and arm and shoulder, with a twist of the trunk to give extra power, down and out, and round and across, as far as it will go. Recover poise and jump back to the alert position.

Now do this exercise with the left hand, the right hand hanging relaxed.

Now pretend to be batting left-handed, at first with one hand at a time.

At intervals breathe leisurely through the nostrils to avoid fatigue or strain.

Then do both sides together, as in the illustration. Here, once more, you may begin in this way till the movement is understood. Bat with both sides together, first as a right-handed, then as a left-handed batsman.

After the exercise, rub down with a wet towel. Rub yourself all over with it, and then rub yourself dry with a rough towel.

The advantages of this exercise, if you do it carefully—that is to say, if you stretch the muscles and feel them stretched, but do not strain them, and if you gradually increase the extent, the rapidity, and the number of repetitions—is that the exercise is safe, inexpensive, and not ungraceful.

It should be attractive to boys and men, because it recalls part of the game of cricket. The practicer can imagine himself to be some well-known batsman.

Undoubtedly the strokes, if done correctly—and a good player should be asked to criticise and point out mistakes before you get the wrong habits—will improve your game and your enjoyment of it, and will give you practice and training when cricket itself would take too long or cost too much. As in the previous exercises, the breathing through the nostrils will help to prevent consumption, as well as to invigorate the body. The heart will be reasonably worked, and the circulation will be improved.

By the stooping and stretching movements the digestion should be bettered, and there should be far less dyspepsia and discomfort.

The general excretion will be increased; partly through the exercise, partly through the stretchings and twistings of the trunk. Thus you will be less self-poisoned than before.

Resume first position. Get ready for a swift stroke.

Besides this, your organs will be held in better position afterwards thanks to stronger muscles. You will improve your carriage, as well as your figure and your appearance in general, if only through the general health.

This special exercise, as distinct from ordinary batting, will give you more independent control of the two sides of your body, one arm resting while the other arm exerts itself.

The relaxing will help to relieve tension and worry.

The exercise is good for increasing your promptitude, rapidity, poise, recovery of poise, accuracy, and power, as well as making you at home with the different movements.

Here, as in the previous exercises, you improve your will-power by concentrating it on an easy beginning.

But do not give up the other two exercises; add No. 3 to Nos. 1 and 2 and you will derive the greater benefit thereby.

HEALTH HINTS.

The health-hint for the first was "Do not worry and do not express worry." For the second it was "Try fewer meals." Now, continue these, and make an experiment with simpler foods.

Many years ago, I rushed into the simpler foods, giving up in a moment all flesh-foods and eggs as well. My first object was to get nourishment which might take the place of flesh-foods.

Before this I had enjoyed my ordinary mixed diet at the time, but had been remarkably unfit afterwards.

My first trials were successful so far as regards fitness. I suppose others might have found the foods somewhat tasteless and monotonous. I did not.

Then, at the suggestion of more than one expert, I began to attend to taste. Now I attend no less than before to nourishment, but much more than before to taste. This is the principle on which I advise people to try the simpler foods.

Here, as in the fewer meals plan, there is no crying necessity for a sudden revolution of habit.

Just as it might suit you to take a somewhat smaller breakfast and move in the direction of no breakfast, so here it might suit you to take somewhat less of the flesh-foods and to move in the direction of no flesh; but do not, under any circumstances, "give up meat and eat the rest," as some cranks urge you to.

No. 4—A ROW ON LAND.

If possible, do this exercise in front of a mirror, so that you may attend to all the various points more easily. Sit on the floor, or on a low stool, or on one of the rowing-machines, which you can easily get from a reputable athletic outfitter.

Keep your back hollow, your chin in, and your mouth closed.

Breathe fully, yet leisurely, as in the other exercises.

Do not frown.

The sitting exercise is familiar to all rowers; it is sufficiently described by the illustrations.

When you come forward, be sure to keep your back hollow and your chin in.

Stretch well in front.

As you come back, bring your trunk back first, with your arms still straightened out.

Then, when you have brought back your trunk, bend your arms and "feather," and get ready to repeat the stroke.

You can do as you like about using a piece of wood. But I should advise you not to. Get freedom of movement to begin with.

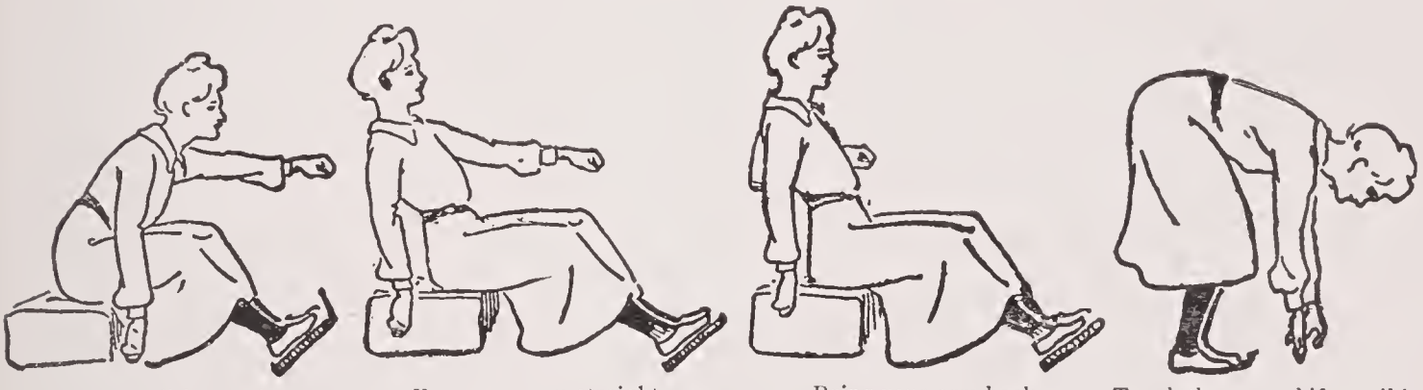
In case you do not care to sit down, here is a variation of the exercise, which can be taken standing; like the swimming, it is especially good for the trunk-muscles and the poise of the body.

The two sides should be exercised independently.

First send your right hand and arm out and down, keeping your shoulders square to the front, while you have your left hand all the time hanging relaxed and limp.

If you like you may first practice the arm-movements as you sit down; afterwards transfer them to the standing position when they are easy to you. The order will be:

Your right arm forward and down with your trunk, then your trunk back and your right arm back, your left arm being relaxed all the time; now your left arm forward, and so on, your right arm being relaxed all the time; now both your arms together, as in actual rowing.



Bend well forward. Keep your arm straight. Bring your arm back. Touch the ground if possible

Be sure to get correctness before speed.

Breathe leisurely at intervals directly you begin to feel tired.

Now add the leg movements as you stand up. You can easily get them by turning the illustrations sideways.

If you like, keep yourself from falling over by holding with one hand to a bed or chair until you can balance yourself easily.

After the exercise, rub yourself all over with a wet towel; then give yourself a horough dry rub with a rough towel.

The advantages of these movements are very like those of the previous movements, provided that the practice is careful and stops short of strain.

You must gradually increase the extent, the rapidity, and the number of repetitions. If you attend to this, and are sure that the air is fresh and the clothing as light as possible, then you will find the exercise safe, cheap, and not unbecoming while you are doing it.

This exercise is quite interesting, and will improve one's rowing, and keep one in practice and training at times when rowing itself is not feasible.

The breathing will increase the lung-capacity, and help to prevent or cure chest disorders.

The heart will be exercised, but not overtaxed, and so the circulation in general will be benefited.

The digestion and assimilation of food should improve in a marked degree.

The trunk movements are especially healthy for this purpose. If you do them correctly, they will bring your organs into a far healthier position.

There is no doubt that your appearance will improve—your figure, your carriage, and your general look of fitness.

As distinct from rowing itself, these movements will give you independent

control, one side resting while the other works. There will thus be less of a strain, and the exercise will help quick athletics far more than rowing does.

Rowing, especially when wrongly practiced, necessitates too much tension of both sides together.

Here, once more, you will increase your will-power by attending to this easy task and doing it regularly. But make up your mind to do the three first exercises as well as this one.

HEALTH HINTS.

Observe yourself or someone else when there is any worry. You will be sure to

Straighten your body.

Stand erect with arms brought back.

find the eye tense, focussed to something very close at hand. You scarcely ever find a worrying person looking at an object very far away.

To remove worry, unfocus your eyes from the immediate present, focus them upon a distant horizon.

If there is no distant horizon, close your eyes and imagine one; you will actually feel the muscles that have hitherto kept your eye tense now relax themselves.

During your holidays study the horizon, so that you may put it in the picture-gallery of your mind. Then, when you incline to nervousness afterwards, you will be able to look at this picture and imagine yourself far away.

If you add a smile, or a broadening of the face, so much the better.

And take advantage of every outward breath to untense yourself ever more and more. Breathe rhythmically, not jerkily.

You may apply a similar plan to the ear when sounds are annoying you. Then, as it were, untense your ear; the sounds will jar far less than before.

Strange and cranky as it may sound, you can even do the same to your nostrils; you can untense your nostrils, and imagine some pleasant smell, as of violets or roses, which may be as far off as the horizon was from the eye, but which you can bring near if you like to use your will.

If the actual horizon and the pleasant smells will not come to you, you can go to them, in your own mental country world and garden.

You can scarcely imagine how useful it is to see certain things from a distance.

How huge the mountains look when you are close under them; how tiny they look when you are far away.

Near at hand, they frighten you and impress you too much. Far away you feel that you are mightier than the hills, especially the molehills of modern worries.

NO. 5—PUTTING A WEIGHTLESS WEIGHT.

Imagine yourself about to put the weight or shot, but do not use a shot at all.

On the way South—the "Morning" following in the wake of the "Terra Nova" through the pack ice. From a photograph taken from the crow's nest of the "Terra Nova." "The two relief ships had to pass through a belt of several hundred miles of such ice. The 'Terra Nova' took the lead by request. In the right-hand bottom corner is the top of our mizzen mast."

Hold your right hand as if it had the shot in it.

Bring it well back and down with your right shoulder, behind you, and bring your head and trunk well back too.

Balance yourself on your right foot.

Keep your left side relaxed.

Now, if you have room, take a few steps forward, as in putting the weight, then keeping most of your weight on your right foot, bend well back.

Now go through the action of putting the shot, which will mean that your right hand will come well up to its full extent, passing close to your right ear.

With it will come the shoulder and the weight of the body.

The right arm will stretch out to its full extent. But you must not lose your poise.

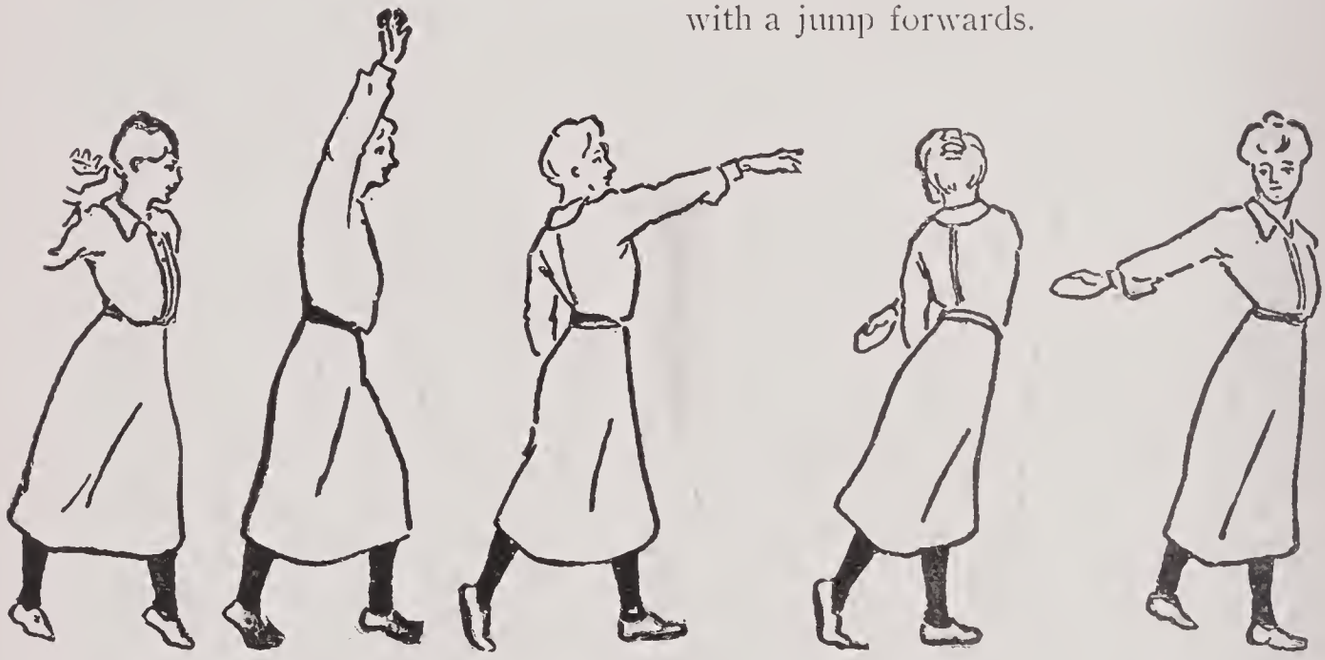
You must check yourself, so that, if you were putting the shot, your feet would not go beyond the line.

Then draw your right arm well back and away to the left as far as it will go, and, with your hand flat and open, sweep across to the right with the palm of your right hand down, and with a good trunk-swing, as if with your flat hand you were trying to knock the top off a tall sunflower.

Let your hand, and arm, and shoulder go away to the right as far as possible.

Next do this same exercise with the left side.

Then adapt it and, as far as possible, do it with the two sides together; only this time, combine the shot-putting movement with a jump forwards.



Raise the hand and arm. Stretch the arm to the full. Let the "weight" go. Make a sweep from left to right. End of sweep.

The advantages of this exercise, if it is done carefully, are similar to the advantages of the other exercises.

You must feel the muscles stretched but not strained.

You must gradually increase the extent, the rapidity and the number of repetitions.

If you do this, the exercise will benefit you; it will be inexpensive and should help to make you feel more vigorous.

The sweep of the hand may help back-

hand strokes at some ball games, and will also help sword-play and single-stick.

By keeping your lips closed you will increase your breathing capacity and free your nostrils, and so help to prevent consumption.

The exercise itself will quicken and equalize the circulation and develop, but not over-develop, the heart.

Be sure to stop in case of breathlessness, palpitation, or giddiness.

The trunk-movements should help your excretion generally.

If you keep your back hollow and your chin in, you will improve your carriage and bring your organs to a better position, and so help the health of the whole body, as well as improve your appearance.

The repose of the unused side will help to give you independent control and physical economy and to remove that tension which excessive use of dumb-bells and grip-dumb-bells is liable to bring to those who are already too slow and too tense.

Once again, you will practice your concéntration by beginning on an easy task. Afterwards you will find concentration on harder tasks less of an effort than before.

But do not give up the previous exercises, which should now be easy. Practice them first, and this one afterwards.

All these five exercises together are nothing like a complete physical development.

They are intended rather to train many important muscles, especially those of the trunk and legs, to give you a better carriage, better poise, greater promptitude, greater power.

If you want to become a sort of crane, a slow weight-lifter and weight-mover, you must go to some one else; but if you are still young and wish to preserve your all-round physical fitness, I advise you to get rapidity before you get this straining strength which is so largely advertised as the ideal of physical excellence for all.

HEALTH HINTS.

Never send out a thought against anyone.

Of course this does not mean never send out a thought against any fault of anyone. Neither does it mean that the writer always keeps to his own rule! He only tries to, and feels that it is a real mistake when he doesn't.

Anything connected with the morals and the character is connected with all-round health and fitness, but beyond this, every undesirable thought and emotion has a bad, an unhealthy, a poisonous result on the whole blood stream.

Professor Elmer Gates, of Washington, made some experiments not long ago to show that every emotion, such as anger, fear, sorrow, joy, and so on, has a definite chemical effect upon the blood; and not only upon the blood, but upon every secretion and excretion of the body.

We all know what effects these emotions have upon us.

Notice the person who is angry. Is it not a physical thing as well as a mental?

He breathes shortly, sharply, shallowly, unrhythmically. That is physical. And it is unhealthy.

He knits his brows; he contracts his eyes; he tightens his lips. And don't you see, if only from his changed color, that the whole circulation of his blood has been put out of order?

Don't you observe the clenching of his

hands, the "clenching" of almost his whole body?

Yes, that anger is a physical thing as well as a mental. It is unhealthy, poisonous, for the body as well as the mind.

But, you say, what is the best thing to do—or, rather, the feasible thing—when a person has injured you?

Without being ungenuine and insincere you can give a hearty wish that this person shall be healthy and good-natured and useful.

You can heartily wish that he shall be good-natured and useful—to you! By that means you expel the old feeling with a new one.

Imagine the person healthy and fit and helpful to you. That is, perhaps, the best remedy for anger.

NO. 6—STARTING, WALKING, RUNNING.

With the feet parallel and quite near to one another, move up each knee in turn straight in front of you to the level of the hips.

Be sure that it moves in a straight line, not curving to the side, as it naturally tends to do.

When you can keep the line easily without letting the chin, the shoulders, or the trunk, come forward, and keeping the small of the back hollow, then add the arm-movements, such as you would naturally use in walking or running, the right hand coming up with the left leg.

Draw two parallel lines on the floor, so that your feet may easily be trained to come down in the right place.

You can vary the pace, first doing the exercise slowly till it is easy, then increasing the speed, then imitating an alternate walk and run.

Now for some changes.

Instead of moving the two arms alternately, move one arm while you keep the other limp and relaxed.

This is a good exercise in control.

In this exercise you should practice often with both hands relaxed, overcoming the tendency to grip them or move them jerkily.

Another change.

The above is a movement straight forward.

It is almost equally important to be

Bring the knee level with the hips.

Movement for the arms and legs.

able to start in other directions, including backwards.

My own favorite exercise is one in starting.

Get into a more alert position, with the feet further separated, the toes turned only slightly outwards. With your legs slightly bent, poise yourself rather upon the insides of the balls of your feet.

Keep your arms ready, not stiff, at your sides, but at about the level of your abdomen.

In fact, get into a position from which

you could easily start almost anywhere at a word of command from yourself or another.

Now actually start; first forward to the right, then back again, then forward to the left, then back again, then back to the left, back to the right, and so on.

Try not to lose your poise; or if you do lose it, try to recover it as soon as possible.

That shows you how you can take any exercises you like—my previous ones if you think them reasonable—and improve on them in some little way, so as to make them more valuable, more prizeworthy.

Only be sure that yours does not last for more than a minute.

By the way, the cricket-drill—the first exercise—lasts me less than half a minute, when I do it once. It is well within the margin. Doing each of the six exercises once takes me less than three minutes altogether.

Do the exercise carefully, increasing the severity, and it will be a safe exercise for most people, especially if you stop and breathe leisurely and relax directly you begin to get out of breath or to feel your heart palpitating.

In that case the exercise will help your trunk-muscles, and, therefore, your figure and carriage. It will help your digestion and excretion.

But this exercise especially will train you in accuracy.

The upward and downward movements of the knees in the Hundred-Up must be straight.

Do not move fast till you can move straight.

The body must be held properly, chin in, back hollow.

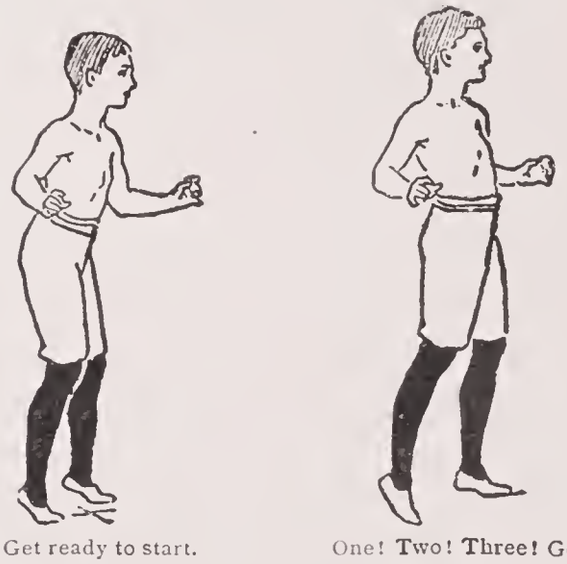
Perhaps the movement is not so interesting as the cricket or swimming practice.

On the other hand, everybody should learn to walk and to run. We neglect our walking far too much.

We should know our country, and we should improve our appearance in the streets, and we should keep in training.

This exercise will encourage walking and running and will help to keep you in training.

The art of being ready to move in a



Get ready to start. One! Two! Three! Go!

direction, including backwards or to the side, is an art as valuable for the mind as for the body.

With all our straightforwardness, directness, strenuousness, and loyalty, we Anglo-Saxons often fail in promptitude and rapid adaptation.

Quite apart from that, the physical habit may save your life when you are crossing the street. It will be of considerable value in self-defence.

HEALTH HINTS.

To hold an unfavorable emotion—anger, sorrow, fear, worry—poisons the blood, and—so Professor Elmer Gates

maintains—"every secretion and excretion of the body."

Now this applies whether your unfavorable emotion—anger, or even grumpy discontent—is about yourself, or some other person.

You know how, in a dream, you think someone else is doing something—you wake up to find that it was yourself all the time.

It was in the mind, but the mind, the memory or imagination, is always a gentle reality.

You cannot remember or imagine a movement without actually doing it—mildly, but still actually.

Think of yourself as unsuccessful, worthless, cowardly, and you tend to make yourself so, as well as to poison and depress and paralyze your energy.

You can say to yourself, "Don't be a fool," or "I won't be a fool." That's another matter. But to realize thoroughly, and genuinely, and convincingly that you are a coward is unhealthy.

There's a lot of talk about forgiving others: I have nothing to say against it. Only forgive yourself as well, and be sure that you have within you the power, and that it's worth while not to make the mistake again.

Use your intelligence, if your will seems weak.

Find out how to avoid the mistake.

Never picture yourself as worthless to the core.

The core is the soundest part of you. Within you there's the all right. And if you invite it, it will show itself.

What puts it back so often is to be told by you that it doesn't exist.

Set yourself in its place.

It would offend you if people constantly insisted that you were simply no one! Yet that's what you are often saying to your best friend, your best self.

And it's this which is slowly poisoning you, as well as your mistakes in diet, breathing, and so on.

NO. 7—HOW TO IMPROVE THE UP-BREATHING.

Most of us, thanks to too much eating and drinking, too much sitting in wrong attitudes, too little training and remedial work, have some of our vital organs far too low.

We must raise them and hold them up, if we wish to be healthy.

Suppose your diaphragm, which is the floor of your lungs and heart and the ceiling of your stomach and liver, sags down too low, then it presses on your stomach and liver, and hinders them from doing their work properly.

They, in their turn, may press down on your colon, and so induce constipation.

Now it is right that the diaphragm should sometimes come down and press upon and massage the stomach and liver, but it is equally important that it should be held up at times, so that these organs may not be cramped.

It is unlikely that you can digest your food, and so on, if these organs are thus hampered.

The exercise will encourage you to hold your chin in, otherwise you cannot breathe so thoroughly.

It will develop your middle and upper, rather than your lower breathing; though it may also develop your lower breathing against resistance.

Men need this practice more than many

badly-corseted women do, for these have their lower breathing neglected, their upper breathing over-developed.

An inducement to you to perform this exercise is that you help your hair to grow, and, by the second exercise, help to remove headache.

It may counteract baldness, in so far as baldness is due to a dry scalp, poor in blood and poor in oil. Of course the exercise is not a panacea for hairlessness. It may be a help; that is all.

The best time for it is when you have washed your head with pure soap and have dried it and have put a little oil or comparatively harmless hair-restorer upon it.

Paraffin or petroleum, ammonia, acetic acid, sea-water, potato-juice, all sorts of things are said to restore the hair of certain people; but they are more likely to restore it if they are accompanied by sensible rubbing.

As usual, keep one hand relaxed and limp at your side.

With the other rub your scalp, especially the top-part towards the back, with the tips of your fingers and thumb.

Keep your chin in.

Keep the expression of your face pleasant.

Before your fingers and thumb become tired, reverse the hands, and so on.

Gradually increase the time during which you continue the exercise from day to day.

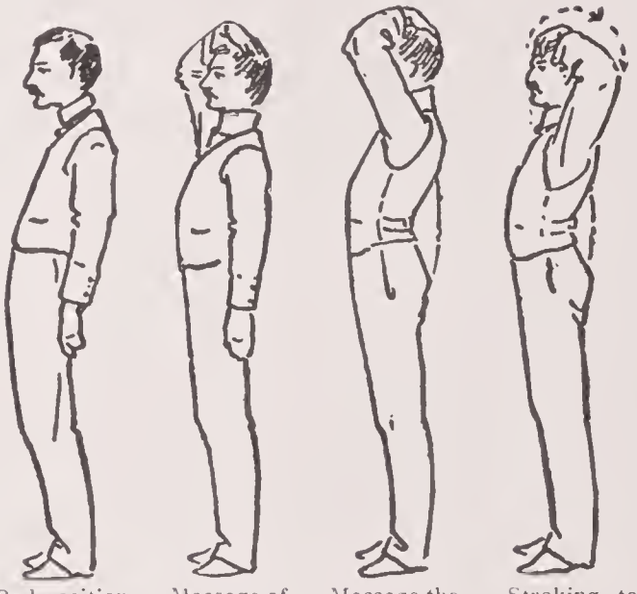
After it, wash your hands, and comb and brush your hair.

In case of tendency to headache or depression, keep one hand relaxed as before, and use the other as follows:

Start with the finger-tips and the palm just above your eyebrows, and stroke softly upwards over the forehead and head, and down to where the collar is, or would be.

At the end of each stroke, which you should do with the two hands alternately, shake the hand you have been using, as if you were getting rid of what is unpleasant.

If this does nothing else, at least it will free the fingers, and improve their rapidity and the appearance of the wrist and arms.



Bad position of slightly bald person. Massage of head and upper breathing. Massage the head with both hands. Stroking to remedy headache.

A remedy for a headache in some cases is to walk backwards.

I have never yet seen an explanation of this, but may it not be that it makes what is just in front of you recede from your view?

An accompaniment of a headache often is a tense and a straining eye.

This exercise will help to do what Dr. George Wilson advises you to do—to unfocus and untense your eye, and look at something further off, if possible the horizon.

This walking backwards will be a useful accomplishment anyhow; for instance when you are crossing a road or playing a game of lawn tennis, or cricket, or football, or hockey.

It will come in in dancing, and on a number of other occasions.

When you can do it easily, then practice it up and down the inclined plank as well, as I suggested last week.

This exercise can be practiced for various lengths of time, from a quarter of a minute up to ten minutes.

Still continue the previous seven exercises, I can perform them all once in less than three minutes.

HEALTH HINTS.

In the early morning, before you have your bath, and, if you like, for a minute or two afterwards, take off all your clothing, open the window top and bottom, let in as much air and light as you can, and enjoy an air-bath.

In case your window is overlooked, you can put a thin gauze curtain over it just for the time being, or an American mosquito-wire curtain.

During this air-bath, if you are at all cold, rub your skin, and pinch the skin all over the opposite side with each hand, using the thumb and first finger.

Be particularly vigorous in pinching your arms. This will free the muscles and improve the circulation.

Go through all the exercises now—but, in case you begin to feel chilly, or tired, at once have your bath or put on some covering.

If you do not care for the full air-and-light bath, have a partial one at any rate—for the upper part of your body, and especially for your feet. Light is very important to the skin.

As a proof of this it is well known how the patients who were on the lighter side of a hospital at St. Petersburg were found by Sir James Wylie to be far healthier than the patients on the dark side. This was while the air of both sides was similar.

It must have been entirely a matter of light, and the curative effects of light are being realized today, not only by the Finsen cures, but by other and far more widely reaching remedies.

NO. 8—BREATHING, STRETCHING, RELAXING.

This exercise is a good one to perform after work or exercise, directly you begin to feel jaded with work or out of breath with movement. Do it in private!

Raise a hand and arm to their full extent.

Lower the hand and arm.

Keep your left hand relaxed and limp by your side all the time. Do not frown, and do not hurry, especially in recovering the upright position.

Sit straight on the edge of an armless chair or of a bed, or else stand evenly balanced on your two feet. Keep the two feet well apart.

Now, with closed lips, not with clenched teeth, take a deep and full breath in and up through the nostrils from the bottom to the top of the lungs.

By the end of the breath you will have drawn your abdomen in and your diaphragm up.

The breath should have lifted with it your trunk, your chest, perhaps your shoulders, your head, and even your eyes.

As you breathe in, lift up also one hand and arm, stretched with palm forward to its full extent short of strain.

Lift it up in front of you, and then above your head as high as it will go without actual discomfort. You should feel the muscles stretching.

Hold the breath in, and hold your hand up for a moment or two.

Now do not force that breath out, and do not rush that hand down.

Let the breath ooze out of its own accord; let the hand sink quietly and limply.

After practice you will find that this outward breath will naturally close your eyes, make your head droop, and then lower your shoulders and chest and trunk till you sink forwards and down.

When you have sunk down a little way, repeat the deep breath in, but do not let it raise any part of you except your chest. As it oozes out, sink further forwards and down.

Stay thus for a moment, and think of something clean and pleasant.

Then get up slowly by bringing your hands back towards your body. That will lift your trunk, and then you can lift your head.

As you finally lift your head and open your eyes, take in a deep and invigorating breath.

Follow this exercise by rhythmical breathing.

Do not force the breath now, but breathe just slightly more fully than usual.

Now do this with the hands reversed, the right hand limp by the side, the left hand raised.

Then do it with both hands raised together.

The exercise seems absurd to you. Most of us anxious hustlers need such an exercise in cities.

The object of it is first to stretch you.

Everywhere in cities you tend to be cramped—your whole body and every part of it. Try to counteract this.

Remember, too, that the stretching empties many of your muscles of their waste, and lets fresh blood flow in.

Then the relaxing must be economical; it must save energy by stopping leakages; for you use energy whenever you are tense.

It must give you also more gracefulness and freedom. These cannot exist when there is so much over-tension in the body.

On the other hand, it will eventually give you firm centres in your body, for you will have more power there, wasting less through your extremities.

Endurance will have increased. What we call overwork is mostly a matter of wasted force. It is not that we have worked too much; it is that we have worked wrongly and uneconomically.

SPECIAL EXERCISES FOR HEALTH AND STRENGTH.

ADOPTED FOR USE IN THE U. S. ARMY AND NAVY.

The first exercise is designed to strengthen the muscles of shoulders and arms, to assist in straightening the shoulders and to throw the chest forward. In assuming position for all the exercises one stands in an erect position, with abdomen drawn in and chest thrown out, though without any tensity, the arms hanging loosely at the sides, heels together and with toes turned out obliquely at an angle of about 45 degrees. In the initial exercise one raises both arms laterally until they are horizontal with the shoulders, the palms turned upward. The arms are then raised in a circular manner over the head and the fingers brought together, so that the backs touch their full length and the tips are at a point about an inch above the head, after which the arms are raised to their full height with the palms of the hands touching and brought back to the original position by a sweeping full-arm movement to the rear.

The second movement is particularly beneficial for the chest muscles and the shoulders. The arms are raised until they are horizontal in front of the body, with the palms together, and then brought back by a full-arm sweeping movement to the rear, at the same time raising the body on the toes, after which the arms may be allowed to drop to the sides or swung to the horizontal position in front and the movement repeated at will. It should be continued, if possible, until one is able to bring the hands together in the rear.

Another excellent exercise for the muscles of shoulder, chest, arms and back, and also for straightening the shoulders, is the third in the regulations, which consists of raising the arms laterally until they are horizontal with the shoulders and then describing a small circle with each arm, fully extended, upward and backward from front to rear, without allowing the hands to pass in front of the line of the chest. The fourth exercise is primarily designed to help straighten the shoulders a little more and thus bring about the erect carriage without which no soldier has a good appearance. In it the tips of the fingers are placed lightly on the shoulders, with the upper arm standing out horizontally, and the elbows are first forced to the front and then as far to the rear as possible.

EXERCISE FOR HAND AND WRIST.

An exercise for the hand and wrist is the fifth. The arms are raised laterally to the height of the shoulders and the hands then closed with considerable force, after which they are opened quickly, spreading the fingers and thumb as far apart as one can. The forearms alone are raised at the beginning of the sixth exercise until they are made nearly vertical, with the fingers extended and joined and the palms of the hands turned toward each other. The hands are then thrust upward with force until the arms are extended to their full length, when they are brought back to the original position at the side by an oblique extended full arm swing to the rear. In the seventh exercise the forearms are raised until horizontal, with the

hands closed and backs down and the elbows forced to the rear. Then the entire arm is thrust forcibly to the front until the arms extend horizontally from the shoulders, the backs of the hands at the same time being turned upward. From this position the arms are brought back to the first position, forcing elbows and shoulders to the rear.

A splendid thing for reducing the abdomen and, in fact, exercising nearly every muscle in the body, is the eighth or trunk exercise. In this the hands are raised to the hips, fingers in front and thumbs in rear, the elbows held well back. The body is then bent forward at the hips as far as is possible, then raised and bent to the rear, all the while the knees

Peculiar photograph of workman making a relief map of the Philippines on a scale of one and one-fourth inches to the mile.

being held rigid and not allowed to bend under any circumstances. Any man with a large abdomen who will go through this exercise alone half a dozen times each morning and evening for several weeks with regularity will find the waistband of his trousers fitting him too loosely by a couple of inches at the end of that time. The ninth exercise is supplemental to the eighth in reducing the abdomen and strengthening the hip and abdominal muscles. The hands are placed on the hips, as in the preceding exercise, and the body then bent first to the right and afterwards to the left as far as one can without twisting it or raising either heel from the floor. In all these trunk exercises rapidity of execution should be carefully avoided and the movements made slowly. The next exercise consists of bending the trunk to the right, then bringing it around to the left and afterwards to the front while still in a bent position, thus describing three-quarters of a circle.

EXERCISE FOR ARM AND BODY.

Arm and body exercises combined are the eleventh and twelfth, two which will place the greatest tax on the individual until facility in their execution has been attained. In the eleventh the arms are raised from the sides until the hands meet above the head, with palms to the front, fingers pointed upward, thumbs locked together and the shoulders pressed back. The body is then bent over at the hips until the fingers, if possible, touch the floor, both arms and knees being kept straight. An erect position is then assumed, slowly, with both elbows and knees still rigid, and the arms allowed to drop to the sides only when all the exercises of this particular form one intends to go through have been finished. The twelfth exercise consists of bringing the arms fully extended to the front in a horizontal line with the shoulders, the palms turned downward and the fingers extended and joined, when the body is bent forward as far as possible and the arms then swung upward without bending elbows or knees. With the arms maintained in this position the body is straightened and the arms then brought forward in a full sweep to the horizontal position in front.

The remaining exercises are all for the legs and feet, and if consistently gone through with regularly each day will bring the muscles of those members to a point of efficiency in the course of due time when a walk of ten miles can be taken without fatigue. In all these exercises the hands are placed on the hips as during the trunk movements. The knees are separated and bent as much as possible in the thirteenth exercise, lowering the body with the head and trunk erect and the heels on the ground, after which the body is raised and straightened and the knees brought together. In the fourteenth exercise the movements are the same except that when the knees are bent the heels are raised so that the entire weight of the body rests on the balls of the feet until the erect position is again assumed.

The left leg is brought forward in the fifteenth exercise, with the knee straight, until the heel is about fifteen inches in front of the toe of the right foot and then swung a similar distance to the rear, the body all the while balanced on the right foot. The right leg is exercised in a simi-

lar manner. In the succeeding exercise the leg is raised to the front with the knee bent and elevated as much as possible, the leg from knee to instep vertical and the toes depressed, after which it is restored to its former position and the other leg exercised in the same manner. In the seventeenth and last exercise the body is raised on the toes, with the heels together, and then the feet are slowly brought back to a flat position on the floor.

From this summary of the exercises it will be seen that not a muscle in the body is exempt from development under the setting-up movements and that the straightening of the shoulders and greater flexibility of the fibers of strength are two of the things most largely accentuated.

TESTING THE PURITY OF COMMON FOODS.

A test for coffee: When purchasing coffee, gather a little of it in the palm of the hand, after it has been ground, and press firmly; if it falls loosely apart when the hand is opened, the coffee is unadulterated, but when the particles adhere, the fact that it cakes denotes the presence of some substance other than coffee.

A simple method of determining whether one has purchased butter or oleomargarine, is to put a little of each in two small tins, and heat over a gas burner. The oleomargarine will boil, while the butter will bubble up and burn. Good butter has a sweet, fresh odor as it burns.

One who has lived in the South will not purchase sweet potatoes which show little sprouts on their surface, or places where sprouts have been removed, for these indicate that the potatoes were exposed to rain or damp weather before they were dug, and no matter how they were prepared for the table are sure to be watery and "soggy."

The tiny booklets containing little strips of red and blue litmus paper, which can be procured at any chemist's, will be found useful for many purposes in the kitchen. The wife of one druggist uses one of the little blue strips to discover whether milk has begun to "turn," and will be likely to curdle if used for custards. When making biscuits or cake of sour milk and soda, after adding the soda to the milk, a strip of the red litmus paper will show at once by turning blue if too much soda has been added, which does away with all "guess work" on the part of the cook.

The mother who purchases the candy she gives to her children can know whether they are eating pure sweets or not by soaking a bit of the candy in clear cold water. If there is a sediment in the bottom of the glass, the presence of some sort of impurity or adulteration is indicated, usually "terra alba," and while the adulteration may not be exactly harmful, the child is not taking pure sweets into the stomach.

Since we are told that it is not the candy but the adulteration that is injurious, it is well to have at hand a simple means for determining whether one is eating pure sugar, with harmless flavoring, or some one or more of the many ingenious adulterations which are sold under the name of candy.

TO TEST EGGS.

A simple method has been found for testing eggs. The egg is placed in a saturated solution of common salt, and the position that it takes will show, so it is claimed, its age. A fresh egg lies in a horizontal position at the bottom of the vessel; an egg from three to five days old shows an elevation of the flat end, so that its long axis forms an angle of twenty degrees. With an egg eight days old the angle increases to forty-five degrees; with an agg fourteen days old, to sixty degrees, and with one three weeks old, to seventy-five degrees, while an egg a month old floats vertically upon the pointed end.

WHEN TO EAT BANANAS.

In their native countries bananas are seldom eaten before the skin is discolored and the pulp of so soft a consistence that it can be scooped out with a spoon. Under the artificial conditions in which they are placed in these climes they undergo somewhat rapid changes, and the times at which they are best suited for consumption may be short and difficult to predict with any degree of precision. Authorities, however, claim that they are habitually eaten here before they have reached their most suitable stage. Before they are thoroughly matured, moreover, they are apt to be insipid in flavor and to cause dyspepsia and other forms of intestinal disturbance.

They should not be eaten before the skin is blackened in places, or when there is any reluctance in the skin to separate from the pulp. Housekeepers know how bananas will change in the course of a single night from a manifestly sound condition to one in which the skin is blackened and the pulp soft and slightly discolored. Now, children infinitely prefer these last bananas to those that are apparently sounder, though their elders may hesitate to gratify their taste in this respect from a fear as to the wholesomeness of such fruit. Attacks of gastric or intestinal disturbance from the use of unsound bananas are far from common, and it may well be that in this instance the natural inclination of the child covers more wisdom than the caution of its elders—in fact, experts say that the banana can hardly be in too ripe a condition for eating. With the rapid changes the fruit undergoes it is hardly surprising that cases of friction between the sanitary authorities and the venders should be of frequent occurrence as regards the fitness, or not, of the fruit for sale or consumption. So be careful to see that the fruit you eat is tender and ripe.

SCIENTIFIC STATEMENT OF AN IDEAL DIET.

The ideal diet is one that strikes a balance between the three different chemical foods. Practically everything we eat consists of these in varying proportions, viz.: Fats, carbohydrates, which are the starch and sugar foods, and proteids, or nitrogenous foods.

Those who combine the three in reasonable proportions enjoy the best diet, and the best health.

Taste is an important feature in digestion, and the fact that well-cooked meat appeals to the taste to a greater percentage than any other food is also an argument in favor of a moderate meat diet. It is all a question of percentage.

HOW TO TELL POISON IVY.

MEANS FOR ITS EXTERMINATION AND REMEDY FOR THE IRRITATION.

"What is poison ivy?" "What does it look like?" "How can it be distinguished from Virginia creeper?" These and similar questions have been asked me hundreds of times, says a writer in Country Life in America, and they are questions that it is well for every one to be able to answer for himself. The leaves of poison ivy often change to beautiful tones of yellow and red in the fall, and are sources of great temptation to any one who is out hunting autumn leaves for decoration. It is better, however, not to have the decoration than to run the risk which one incurs by handling this plant, unless, like myself, he happens to be immune from its effects.

Poison ivy has three leaflets, and Virginia creeper has five. The former has white berries, the latter purple.

Poison ivy is often troublesome in gardens and grounds, as well as on the farm, where it infests fence rows. On the farm it can be plowed out, but a single plowing is not enough. Five or six may be necessary before the fragments cease to send up new leaves. Any plant can be smothered in this way—even "quick-grass," which is propagated by being cut to pieces. The one essential thing is persistence. The leaves of a plant are its "lungs," and if the leaves are cut off as soon as they appear, the plant will die. It is a sure way, but you must keep "everlastingly at it."

The same principle applies to the garden, where poison ivy can be exterminated by the frequent use of the hoe. Few people are so sensitive that they will be poisoned at the distance of the length of the hoe handle. Most cases of poisoning are supposed to come from direct contact of the leaves on cut fingers or other bruised surfaces. A good way to get rid of poison ivy in a garden is to hire someone who is immune to root it out and keep rooting it out until it never shows a leaf again.

All the drugs in the world are of no use in preventing a bad case of poisoning, unless one begins to do something as soon as the tell-tale itching begins. When the postules break open one is almost sure to be in for three days or a week of suffering. It is well to have a little bottle of the extract of grindelia in the house all the time. Ten cents' worth is enough. You can get it at any drug-store. Rub it on the affected parts every five minutes until the trouble is averted, and be sure to lose no time in beginning.

There is another member of the Rhus family which we should avoid, as it is as poisonous as poison ivy, if not more so. This is the poison sumac, or poison elder (Rhus Vernix). It is a short or small tree, sometimes growing to a height of twenty-five or thirty feet, but usually not more than ten or twelve. It is indigenous to the Middle and Eastern States, growing in swamps and low marshy places. Its foliage consists of from three to five pairs of opposite leaves and one terminal leaf to each petiole, and to an ordinary observer it appears like our common staghorn and other sumacs. At all times its swamp-loving habits—for it is never found elsewhere—should serve to identify

it, while in autumn it proclaims itself in unmistakable terms, for, as Thoreau puts it, "it blazes its sins as scarlet." Moreover, its berries are white, as are those of the poisonous ivy, instead of red, as are those of all the other sumacs, and this is the most important point of difference.

Of the four other sumacs which grow with more or less abundance throughout the Middle and Eastern States, we need have no fear, as they are all harmless. In every instance the berries grow in dense clusters and are bright red. The leaves are in many pairs on the same petiole, with the single exception of the fragrant sumac (Rhus aromatica), which, like the poison ivy, has but three leaflets; but this need not in the least confuse one, as the shape of the leaves and the general characteristics of the plants are in no wise the same.

There is a little gingle which I remember having at some time read, which, concisely, if not very poetically, explains these differences, and which, if committed to memory, will always serve to distinguish the poisonous and non-poisonous sumacs:

"Berries red
Have no dread;
Berries white
Poisonous sight;
Leaves three
Quickly flee;
Leaves three, with berries red,
Fragrant sumac, have no dread."

IMPORTANT TOPICS OF HEALTH.

FLIES AND TYPHOID.

Science has given the housewife a strong reason in addition to the many good ones she already has for waging relentless and unremitting war upon the Musca domestica, otherwise called the house fly. Science has shown that this insect is one of the most ubiquitous and malignant disseminators of the deadly typhoid bacillus. Evidence on the point seems conclusive.

In 1897 Celli inoculated animals with bacilli from flies. They were soon sick of typhoid fever. Typhoid epidemics rage in summer when flies are numerous. The frosts that kill the flies also stop the epidemics. Typhoid epidemics are especially common among large bodies of soldiers. They usually have been attributed solely to impure water. The commission that investigated the typhoid epidemics in the camps of the American army during the war with Spain, found that the water supplies were good. The commission concluded that the flies which swarmed in all the camps had deposited enormous quantities of bacilli in the soldiers' hard tack and "sow belly," and that this was the true explanation of their sickness. Those who investigated the typhoid epidemics in the British camps during the Boer war arrived at a similar conclusion.

The fly is notoriously one of the filthiest of insects. It habitually feeds upon the foulest of organic matters. In matters of this kind typhoid bacilli flourish most numerously. With its antennæ, eyes, legs, wings, and entire body covered with bacilli collected from these substances the fly sails to the pantry where food is

kept or to the table where it is being eaten. It lights on the bread, proceeds to the meat, tests the fruit and vegetables, perchance tumbles into the syrup. On everything it touches or passes near it deposits innumerable typhoid bacilli. It is in this way, according to science, that flies propagate typhoid. All who eat food that they have visited expose themselves to this disease, whether they get it or not.

The practical deduction from these facts is that one of the best ways to prevent typhoid is to keep flies away from food. Shut them out with screens. Chase them out with a dishcloth, as the old fashioned housekeeper did. Lure them to death with sticky fly paper. Leave no food, cooked or uncooked, wet or dry, where they can get at it. Be especially vigilant to prevent them from buzzing over the dining table while a meal is being eaten.

If flies were prevented from carrying bacilli to food, typhoid epidemics would become much less frequent and deadly.

CARE OF THE EYES.

Too strong a light is as great an evil as one too dim, and when reading, writing or sewing the light, whether natural or artificial, should come from the left. It should never fall full in the face, but upon the work.

Daylight is best when not sifted through curtains, and artificial light should be clear, steady, soft and white. The craze for colored lamp shades has injured many eyes.

The eyes should never be steadily employed by artificial light, especially after a day's hard use, and to strain them in fading twilight or by reading in cars or trains is an injurious practice.

SENSE OF SMELL.

That human beings have not entirely lost this animal basis of judgment is proved by the fact we do tell ourselves very much of other people by the nose, often unconsciously. The blind distinguish their friends by the smell of handkerchiefs or coats. Unconscious sensations and unconscious judgments have their field. We know far more by smell than is supposed. Some classes have apparently become degraded in senses as well as habits, for their basis of social judgment is below that of the animals. Those who have had their senses keenly educated are accustomed to judge of persons by odors. Australian children possess the doglike sense of trailing people by scent, and experiment reveals that this is to some degree present in everyone.

VEGETARIANS.

At least seven-tenths of the population of the globe never eat flesh meat. In India, China, Japan and adjacent countries there are about 400,000,000 people—strong, active, healthy, longlived—who eat no flesh meat. In Europe are the peasants of Russia, the Corsican farmers, the Scotch Highlanders and other vegetarian peoples, well developed physically and capable of great endurance.

AN AID TO DIGESTION.

A slice or two of pineapple after a meal is a great aid to digestion. Fresh pineapple juice contains a remarkably active digestive principle similar to the pepsin that is secreted by the human stomach. This digestive principle of the pineapple is called "bromelin," and its action upon proteids (that is albumen-like sub-

stances) is so powerful that it will digest as much as 1,000 times its own weight within a few hours. Its digestive activity varies, as might be expected, according to the kind of albuminous material upon which it acts. Fibrin (which is the albuminoid substance that causes blood to coagulate) disappears entirely after a time. With the coagulated albumen of cooked eggs the digestive process is slow. Upon the albumen of lean meat the digestive principles of the pineapple first produce a pulpy, gelatinous mass, which completely dissolves after a short time. When a slice of fresh pineapple is placed upon a raw beefsteak the surface of the steak gradually becomes gelatinous, owing to the digestive action of the pineapple juice.

JAPANESE LESSONS ON HEALTH.

The Japanese have taught Europeans and Americans a lesson and quenched in some degree the conceit of the Caucasian in his superior capacity to do all things. Even in the matter of diet, our long-cherished theory that the energy and vitality of the white man is largely due to the amount of animal food consumed must undergo revision. The Japanese are allowed to be among the very strongest people on the earth. They are strong mentally and physically, and yet practically they eat no meat at all. The diet which enables them to develop such hardy frames and such well-balanced and keen brains consists almost wholly of rice, steamed or boiled, while the better-to-do add to this Spartan fare fish, eggs, vegetables and fruit. For beverage they use weak tea without sugar or milk, and pure water, alcoholic stimulants being but rarely indulged in. Water is imbibed in what we should consider prodigious quantities—to an Englishman, indeed, the drinking of so much water would be regarded as madness. The average Japanese individual swallows about a gallon daily in divided doses.

The Japanese recognize the beneficial effects of flushing the system through the medium of the kidneys, and they also cleanse the exterior of their bodies to an extent undreamed of in Europe or in America. Another—and perhaps this is the usage on which the Japanese lay the greatest stress—is that deep, habitual, forcible inhalation of fresh air is an essential for the acquisition of strength, and this method is sedulously practiced until it becomes a part of their nature. The Japanese have proved that a frugal manner of living is consistent with great bodily strength—indeed, is perhaps more so than the meat diet of the white man. As to the water-drinking habit, which is so distinctive a custom with them, it is probably an aid to keeping the system free from blood impurities, and might be followed with advantage in European countries, to a far greater extent than is at present the case. Hydropathy and exercise seem to be the sheet anchors of the Japanese training regimen, and, judging from results, have been eminently satisfactory.

NOTED PRECEPTS FOR LONG LIFE.

1. Rise early, retire early, and fill your day with work.

2. Water and bread maintain life; pure air and sunshine are indispensable to health; and do not worry.

3. Frugality and sobriety form the best elixir of longevity.

4. Cleanliness prevents rust; the best-cared-for machines last the longest.

5. Enough sleep repairs waste, and strengthens; too much sleep softens and enfeebles.

6. To be sensibly dressed is to give freedom to one's movements, and enough warmth to be protected from sudden changes of temperature.

7. A clean and cheerful house makes a happy home.

8. The mind is refreshed and invigorated by distractions and amusement; but abuse of them leads to dissipation, and dissipation to vice.

9. Cheerfulness makes love of life, and love of life is half of health. On the contrary, sadness and discouragement hasten old age.

AN AGED PHILANTHROPIST'S RULES FOR HEALTH.

Dr. D. K. Pearsons, the well-known philanthropist of Chicago, on his eightieth birthday gave out the following rules for longevity:

"No pies, no cakes, no pains, no aches.

"Most men dig their graves with their teeth.

"If you overwork your liver it will soon tell on your brain.

"Live like a farmer and you will live like a prince.

"Men can live ten days without eating, but they can't go without pure air for five minutes.

"Don't get angry and don't get excited. Every time you fret you lose a minute of life.

"If you catch a cold lose your quinine and eat an onion."

THE MAZDAZNAN OR "WORSHIP OF LIGHT" PRECEPTS FOR LONG LIFE.

More people die from overeating than from excessive drinking.

Sin and desires that destroy come from indulgence in the appetites.

Subjugate the flesh by fasting. This gives strength to the spiritual and kills the destructive desires.

Control your thoughts. Foolish and wandering thoughts are like unassimilated food—only breed disease.

Don't eat meat. Eat grains, fruits, nuts, bread of whole wheat, not made by fermented yeast or salt.

Coffee from Arabia is permissible. Tea from violets, rose leaves, lavender, flax and barley is the right thing.

Fresh air is of more benefit than food, for a man may go without food and live, but he cannot go without air.

Don't drink malt or spirituous liquors, and water as sparingly as possible. Don't smoke.

Take long, deep breaths and exhalations.

SCIENTIFIC PRECEPTS FOR HEALTH

Mr. Fletcher, with Yale and Cambridge, England, university backing for his theories and experiments proving them sums up with the following five points the scientific essentials for health.

1. Any one can live on one-third the amount of food usually eaten, and be healthy and vigorous.

2. Only five hours' sleep are necessary.

3. When food is thoroughly chewed the waste of digestion is reduced nine-tenths.

4. The appetite indicates the need of the body and wants simple food.

5. Since an important part of digestion is done in the mouth, thorough chewing is necessary.

RULES FOR ATTAINING OLD AGE.

Sir James Sawyer, an English physician, has formulated the following nineteen rules for prolonging life to 100 years:

1. Eight hours' sleep.
2. Sleep on your right side.
3. Keep your bedroom window open all night.
4. Have a mat to your bedroom door.
5. Do not leave your bedstead against the wall.
6. No cold bath in the morning, but a bath at the temperature of the body.
7. Exercise before breakfast.
8. Eat little meat, and see that it is well cooked.
9. (For adults). Drink no milk.
10. Eat plenty of fat, to feed the cells, which destroy disease germs.
11. Avoid intoxicants, which destroy these cells.
12. Daily exercise in the open air.
13. Allow no pet animals in your living room. They are apt to carry about disease germs.
14. Live in country if you can.
15. Watch the three D's—drinking water, damp and drains.
16. Have a change of occupation.
17. Take frequent and short holidays.
18. Limit your ambitions, and
19. Keep your temper.

HEALTH MAXIMS.

A maxim is useful because of its readiness of application. The mind has to reduce its conclusions to postulates before it can apply them to practice.

1. The commercial value of a life lies solely in its productive period; the other periods are a burden upon this.

2. This period should be prepared for from infancy, protected in adult life and extended as long as possible into old age.

3. Constitutional vigor is created mainly by proper food and proper hygiene in youth.

4. No person over 40 years of age should subsist mainly on animal foods, which are very good in early life. The reason for this is contained in maxim 14. The elasticity of some of the most important tissues in the body cannot be preserved by a person over 40 years of age who continuously loads up the body with the waste products of nitrogenous foods in excess, even if he had the best food in youth. Fruits and cereal foods should be largely and generally used by all persons over 40 years of age.

5. Nerves are exceedingly important. They grow best in the country. Let youth be passed as much as possible away from the crowded centres of population.

6. Education may be misdirected, and may be overdone. A good machine may be ruined by making it too elaborate. A good knife may be rendered useless by sharpening it all away.

7. Regular, moderate, physical exercise is essential, and is generally neglected.

8. Do not make a burden of amusements. They may, and often are, made worse than overwork or undue worry.

9. Do not set an impossible ideal of life. It results in disappointment, and that ages.

Chicago society going to the races on Derby Day.

10. Cultivate a serene mental attitude, and develop a capacity for deliberate enjoyment of whatever is at hand. The greatest pleasure often comes from little things easily and often overlooked.

11. Avoid every excess. Do not overwork, overplay, overeat, overdrink or oversmoke, or allow yourself to become overinactive.

12. Do not assume obligations that you cannot discharge. This is the secret not only of much physical but of much moral and mental disaster.

13. Study your diet and your hours of labor, sleep and relaxation, and conform to your constitutional requirements.

14. Take particular precaution to preserve by daily actions the elasticity of all of the tissues.

15. Maintain self-respect, avoid sordidness and gloom, and "grow old gracefully."

SECRETS OF LONG LIFE.

Scientific rules discussed before the Royal College of Physicians of England, by the famous British scientist and physician, Sir Herman Weber.

What is the real secret of long life and how can a human being manage to live in the enjoyment of good health and spirits for a hundred years or more?

This is the question which the famous British scientist and hygienist, Sir Herman Weber, attempted to answer the other day in a highly interesting discourse to the Royal College of Physicians. The views of the noted physician are startling in their simplicity, and, at the same time, so clear and easy of comprehension that anybody can understand them.

The same question when put to great statesmen, scientists, and others who have reached almost to the century mark of life has been answered in various ways. It was supposed that old and intelligent men would naturally have formulated some theory to account for the length of their lives.

RULES OF THE FAMOUS.

Von Moltke, at the age of 90, was still possessed of fine intellectual power and remarkable vitality. When asked how he managed to live so long and in such excellent health he replied:

"By great moderation in all things and by regular out-of-door exercise."

Crispi, the famous Italian statesman, said: "Regularity and abstinence are the secrets of long life."

Neal Dow, the American apostle of temperance reform, replied, when asked this question: "Refrain from fretting."

Cornaro replied: "Extreme temperance in eating and drinking."

Dr. G. N. Pope, the aged Tamil scholar, said: "Be sure to have some great life work to do which holds you upon the earth for the accomplishment of a purpose and you will live."

These words from the lips of eminent men who lived to a wonderful old age are of intense interest, but they are not the cold and judicial advice of the scientist, who, however, does not disagree with them altogether.

Sir Herman has worked out an ingenious plan for prolonging one's life, and simple as his advice may appear to be, it is based upon years of careful examina-

tion, observation, research, experiment, and reading, and is, therefore, worth the trouble of learning and remembering.

FIRST RULE: AVOID DISEASE.

Sir Herman's first word of advice to those who would live long is to avoid disease, especially such diseases as one is disposed to contract through inherited weakness. This is to be done by knowing one's own predisposition to disease and exercising the necessary care in occupation, general habits, and diet that will indefinitely postpone the attack to which one is predisposed from birth.

He next advises such care in diet and general habits of life as will defer as long as possible the hardening of the coats of the blood vessels, that generally comes on before its natural time, and other deteriorations of bodily vigor that are the concomitants or equivalents of the physical conditions of old age. In old age the tissues dry up and the joints stiffen. Keep your tissues moist, says Sir Herman, and your joints well oiled.

The first thing needed to keep the tissues healthy and strong and the various organs in good working order is a certain quantity of exercise taken every day. Regularly taken exercise strengthens the heart, thereby causing that great organ to pump the fluids of the body to the remotest corners and thereby improving nutrition and causing all the other organs to do their natural work and to take a delight, so to speak, in doing their natural work. This nutrition abundantly supplies the body with power and furnishes material for the combustion, which, when sufficiently strong, gives the body the ability to resist chills, which are the natural enemies of life. A prerequisite to the successful effect of exercise is oxygen. Hence, fresh air in plenty is the second needful thing.

HOLIDAYS AND EXERCISE NECESSARY.

Holidays, or days of rest, at least one in a week, are necessary for long life, according to Sir Herman's theory. But he seems to insist upon regularity in exercise. Of exercise he advises two kinds. First, the most natural of all exercise—which is walking. The man who would live long should walk every day for at least one-half an hour, and that in all kinds of weather. The long liver must not be kept indoors by rain, snow, or wind. The regularly recurrent walk of half an hour must be taken, rain or shine, for this regularity of the thing is half of its virtue. "If I rest I rust," said Luther.

But these inspirations, to be of lasting benefit, must be taken in a peculiar way. Lying on the back and rising to a sitting posture during inhalation or swinging the arms about, if the inhalation be taken standing, gives free play to a large number of combinations of muscles, the action of which reacts on the various vital organs and imparts strength and elasticity to the whole body. This combination of muscular movement, with the deep inspiration, has, says Sir Herman, the same effect as mountain climbing, which, as is notorious, is the most healthful, long life-giving kind of exercise known.

VEGETARIANISM IS BEST.

In the matter of food, Sir Herman's recipe for longevity will strike the American people in a weak spot. His most important advice is refrainment from large quantities of meat and eggs. Meat or

eggs, he says, when eaten in large quantities or continuously every day for the three meals, or even for two meals, are as destructive to length of life as the regular and free consumption of alcohol. In fact, no matter what kind of food is taken, the quantity should be small. The human body can live and thrive and work hard on a surprisingly small quantity of nourishment. Great moderation in eating is, therefore, one of the keys that unlock the doors of long living.

Drinking, too, should be regulated, especially in the matter of tea and coffee. Little tea and coffee will go a long way, according to the plan laid down by Sir Herman. Little alcohol, or none at all is better still, whereas tobacco is bad, although great temperance in these things, when they are used at all will prevent the shortening of life that comes of their free use.

One of the strongest recommendations of the system is a liberal use of the brain. The brain must have exercise as well as the body. No matter how much the body is exercised, there can be no long life or healthy life if the brain is idle. That is why so many men of intellect or of affairs live to such old age. The brain, so says Sir Herman, must have exercise or it will die early, and the whole body will die with it. He therefore advises the man who would live to be quite old to find some subject that will interest his mind and devote himself to it with great energy. He advises fat and gouty idlers, who are afraid of death to study zoölogy, chemistry, or some other science. Lord Salisbury was one of the most enthusiastic chemists in England. Bismarck and Gladstone, Crispi, and others were statesmen; Pope Leo XIII had the care of his great church on his mind; Darwin, Spencer, Huxley, Secchi, Dalton, and a hundred other scientists and pholosophers lived to an old age, although they were physically complaining almost their entire lives.

In mental exercise Sir Herman advises variety. The more varied the intellectual pleasures of a man the longer will he live; that is, if his body is paid attention to; and if his body is cared for he will live to be old and in health also.

SUMMARY OF THE RULES.

In summing up the rules for producing longevity Sir Herman lays down the following regime:

Avoid discontentment and worry. Worry is one of the surest life shorteners known.

Rise early and retire early. This is important, for it was practiced for long ages by the ancestors of civilized men and is a natural habit.

Practice moderation in everything, especially in eating.

Breathe pure air, getting plenty of oxygen with every inhalation.

Take regular daily exercise.

Do not sleep more than six, or, at most, more than seven hours.

Exercise the brain every day.

Bathe daily.

Practice deliberate and careful control over all passions, especially over anger, which destroys more tissue than any other passion.

Control nervous fear. Learn to be as unafraid as possible.

If this rule of life were in general use Sir Herman is convinced that the length of human life would be immeasurably increased.

SCIENTIFIC METHODS OF RETAINING THE STRENGTH OF YOUTH.

The clinical picture of approaching death is divided by Tessier into those structural degenerations involving, first, the heart and blood vessels; second, the lungs; third, the kidneys; fourth, the digestive organs, and fifth, the brain.

First of the heart, which is now recognized to be the organ which plays the chief part in the ending of life. Before we knew much about the subject it was natural to infer that the heart was chiefly at fault, and the common phrase was often used of death by "heart failure," one which we now know to be scientifically correct, but aforetime vaguely employed. Then discoveries were made that the arteries in the aged were nearly always diseased, and medical thinkers went so far as to assert that all cases of death in old age resulted from the hardening of the arteries. It is true that this is an accompanying phenomenon in most instances, and, perhaps in all, but it is recognized to be not the most potent factor in a certain large proportion.

What is to be said here is not meant for a guide to the aged individual by which he may be encouraged to form independent judgments for himself, but rather to act as items of useful information, through which he can better interpret the statements and appreciate the importance of following the directions of his physician.

THE WARNING OF SHORT BREATH.

The heart of a healthy old person has become fatigued in its structure through a decadence of its nerve supply. The pulse is rather quicker than during middle life; it is more or less irregular and becomes increasingly so. In a healthy heart there is, however, a regular irregularity, a normal sequence of alterations in the rhythm and force which is only significant when studied by the trained physician. The phenomenon which is one of the most constant and inevitable, as the effects of age begin to make themselves felt, is shortness of breath on exertion. This has to do more with faults in the action of the circulation and the vasomotor nerves than in the lungs. The old man finds himself distressed in his breathing while undergoing a degree of exertion which aforetime would produce no noticeable effects. The heart muscle is old, relaxed and softened and contracts imperfectly and readily shows exhaustion. This need not produce alarm, but if the condition rapidly increases it may be significant of some important change and should be referred to the medical adviser.

In fact, it cannot be repeated too often that the more constantly the aged person remains under observation of a wise physician, the more safely it can be promised that he will live happily and long. There is a symptom which is most terrifying and frequently occurs in the aged, and that is a sudden agonizing chest pain, during which the sufferer, unless he be of unusual mental equipoise, feels that he shall instantly die. This may come on suddenly without previous warning and requires the best medical advice, but it almost always passes and may recur many

times, and is capable of much relief. It may be a symptom of chronic myocardial degeneration.

The lungs also, in most instances, share in the process of death. The changes which occur in the aged lung are degenerative and need have nothing to do with any previously disordered processes in them. Again it may happen that certain changes common in old age take place and prove to be most distressing; the chief of these are asthma, chronic pneumonia and bronchitis. Pneumonia in the aged is a very serious affection, and it is stated that the largest number of deaths in old people are caused or accompanied by acute broncho-pneumonia.

THE MEANING OF SECOND CHILDHOOD.

The digestive organs sometimes give way while the rest of the organism remains in fairly good condition. Sir William Thomson has written charmingly upon the digestive disorders of elderly folk, and it would be well for every old person to read his suggestive essays. Unless care is observed in regulating the diet (and the chief point here is rather a reduction in the amount than particularizing as to the items of food taken), distressing phenomena will constantly arise. Fortunately this is easily avoided, although not so readily cured. Sir William Thomson makes the assertion that the disappearance of the teeth is a plain indication of the return to a second childhood, and therefore the food should be of such a character as may not require the assistance of the teeth in mastication. He advises most wisely, although his recommendation cannot be taken literally, that the teeth be not replaced by artificial ones, for thereby is a peril lest more food be taken than the organism can dispose of.

The fact that the various organs concerned in the elaboration of food share very early in the degenerative changes of age makes it clear that the character of the food taken should be so simple in kind that no great strain would be placed upon these atrophied organs. The gastric juice is secreted in less quantity, and so of the pancreatic, the biliary and the intestinal juices. The lessened quantity of bile makes for constipation and the formation of gallstones and impairs absorption, and assimilation is thus interfered with. The kidneys, the chief source of elimination of a most elaborate series of poisons, become enfeebled in their action, and hence should not be overtaxed by either the quantity or the quality of the work they are called upon to perform. Finally, the brain may be the part which gives way most prominently, and then we may find hemorrhages into its structure, a softening begins, and alteration in mentality, which points the way to more remote and serious changes.

It is a matter of common observation that in some families senile changes occur much more early than in others, and yet there may be little of degenerative change apparent or probable because of the vigor of the individual. As the gradual steps of growth lead to development, so does the phase of existence called senescence merge insidiously toward the ending called death, through a progressive and insensible diminution in all the organic activities. Death should be regarded as a normal function. Ordinarily it is free

from pain, and hence should be free from sadness.

FACTS ABOUT OBESITY.

Excessive fatness, or polysarcia, is not confined to advancing years; it is observed at all ages; but the quality of the accumulation in early years differs from that seen in late middle life. During the earlier years excessive gain in weight is usually the product of full digestive capacity, with a somewhat lessened eliminative power, and can be met by reduction in diet and active exercises, and is, as a rule, controllable. With that form of obesity which is not altogether manageable in young people or those on the hither side of middle life, we have nothing to do, except in so far as we should discuss this condition and its progress when encountered in later years.

It is always a dangerous thing for persons to undertake their own treatment for obesity if they make use of drugs, because great harm can be done; it may be irretrievable. There is no objection, however, to moderating the diet, increasing exercise and, above all, to employing systematized physical training for the purpose of improving elasticity in all the tissues. It is only safe to do so under medical advice.

When we have to do with the fat anemic person vastly more care must be used. The heart in these cases is likely to be infiltrated by fat and the muscular fibers clogged and inelastic, and must be taught slowly to regain their contractile vigor. At first, climbing stairs under direction is about as much as can be attempted, and any house will serve, merely regulating the number of steps walked up and down (both being of benefit) and the rate of speed carefully specified.

SPECIAL GENERAL DIRECTIONS IN HEALTH REQUIREMENTS.

Among other circumstances influencing the duration of life heredity is of great influence. Those whose ancestors have lived to great ages have a good chance of longevity, while those whose parents and blood relations have died early have mostly inherited a tendency to short lives, yet it is possible by judicious arrangement of the manner of living to increase the duration of their lives, especially by counteracting the tendencies of which their short-lived ancestors have died.

EATING AND DRINKING.

There should be moderation of eating and drinking, especially in regard to meat foods. The rule of moderation applies to the whole life, but the necessity for it is increased in old age, when the organs and tissues are able to take up only a much smaller amount of nourishing material than in youth. Few people have an idea of the small amount of food required in old age and the fear of many persons that by eating little they may lose strength is entirely unfounded.

As to the food accessories, alcohol is quite unnecessary for most persons and ought to be avoided entirely, excepting in the smallest quantities.

As the nervous system exercises great power on all the functions of the body, it ought to be kept in a healthy condition by regular mental work and judicious occupations. The fear often expressed that steady mental work is likely to wear out the brain too soon is unfounded. The wearing theory is wrong, as well for mental as physical work, both of which may be continued in old age.

Well directed mental work assists the nutrition of the brain in a similar way as action of a muscle promotes its nutrition. Work is the best preventative of mental depression and the most powerful promoter of a cheerful mental frame, a contented mind, sympathy and hope, which exercise a highly beneficial effect on every function of the body.

AUTO-HYPNOTISM AND SELF-SUGGESTION AS NATURE'S CURE.

You can easily cure your insomnia by auto-hypnotism, unless it be a case of too long standing. Of course, the mere mention of the word "hypnotism" suggests an ocean of mysteries. Yet, you probably hypnotize yourself a dozen times daily without knowing it. Of course, you do not put yourself involuntarily to sleep a dozen times a day. Sleep is not a necessary accompaniment of hypnosis. But you can make yourself sleep, as well as do many other things not listed in the routine of your natural inclinations.

You will rise in the morning at an hour which you have impressed upon your involuntary mind before going to bed. This phenomenon can work both ways. Hence you can train yourself to fall asleep at a moment which you have kept fixed in your mind during the day; not the first time you try it, perhaps, but you can soon train yourself to do it.

Here is a practical illustration of the force of voluntary auto-suggestion: Stand erect with your eyes closed and concentrate your attention for a few moments on the sensation of falling backward. You will begin immediately to sway in that direction. The same force with which you here unconsciously contracted the muscles of your legs and back will assist in taking the blood from your brain and inducing sleep.

HYPNOTIC LABORATORY.

A hypnotic laboratory at home can be fitted up by pressing into service only the ordinary articles of domestic use. There are no end of needless whirly-gigs sold to induce the hypnotic state. These mechanical aids are valuable for concentrating attention, fatiguing the eyes or deceiving the superstitious subject. But your bedroom can be converted into a fully equipped laboratory by such simple acquisitions as a candle, a hand mirror, a lead-pencil, a bottle, a stick of crayon, a sheet of wrapping paper and such common articles as are counted among the sundries of the humblest abode.

Place a lighted candle behind a round bottle of colored glass—an ordinary green bottle—and gaze at the spot where the light focuses on the opposite side. Let the room be dark. Previously disrobe and be in bed ready for sleep. Concentrate your stare upon the light spot on the bottle and in time your eyes will grow so fatigued as to naturally close. The head should be high, as sleep is produced by the blood leaving the brain. When the head is elevated gravity aids to drain off such of the vital fluid as is not needed to nourish the brain during sleep. The bottle will serve as a screen against the glare of the candle. The latter can be cut short in order that it may burn itself out soon

after sleep ensues. Should you be nervous about letting the candle burn while you sleep, set it upright in a china plate, sticking it fast with a few drops of its hot grease. Then when it dies out it can do no harm.

TO MAKE A HYPNOTIC EYE.

Draw a large picture of the human eye upon white paper, using a soft black crayon. Hang the paper where the rays of your candle or night lamp will illuminate it. Stare at this eye for a quarter of an hour, if need be. Try to refrain from winking. If the eye be sufficiently staring in its aspect it will finally "stare you out." Your eyes will grow fatigued and you will fall asleep.

Make a cone about eighteen inches long out a sheet of white paper. Place the large end to your eyes and stare at the candle through it. Having maintained your stare thus for about three minutes, close your eyes. You will still see the outlines of the candle. Gaze at this image steadily —that is, continue to endeavor to see it, and after it has disappeared imagine that you see it until it reappears. This experiment frequently induces sleep in a very short time.

Stare into the pupils of your own eyes reflected in a mirror placed conveniently upon a stand or table close by your bed and at a distance of ten inches from your face. Stare until your piece of candle burns out. Even before that time your eyes will probably be closed in sleep.

Hold one end of a long lead-pencil between your teeth and allow your gaze to run up and down its polished surface until the eyes close of their own accord. The same effect can be produced in the dark by staring at any imaginary spot at the tip of your nose. Touch your forehead with your finger. Then roll your eyes up under your lids and imagine that you are looking through the top of your head at this particular spot. Do this for three minutes and drowsiness will probably cause the eyes to mall and the lids to remain closed in natural repose. One method recommended by a hypnotist is to close your eyes and count the bright spots coming and going on your eyelids. Anyone can see such spots if he closes his eyes.

EXERCISE THE IMAGINATION.

Close your eyes and imagine that you are looking at the ceiling. Having done this for a moment, make yourself believe that you are looking into the corners of the ceiling, one after the other, in order. One hypnotist recommends the following: Close your eyes. Drop your head forward upon your chest. Then imagine that you are looking up and down your spine, from behind.

Imagine that you are counting the number of bricks on the corner of a high building. Commence at the bottom and count up. If you reach the top before falling asleep, then start at the top and work downward. The eyes must be closed during this experiment, which is recommended by a teacher of hypnotism. This same authority teaches his subjects to pretend to sleep by taking a comfortable position and snoring lightly. This, he says, tends to encourage sleep, the same effect being produced by trying to yawn again and again, thus encouraging natural yawning. Of course, you must be in a comfortable position, ready for sleep,

during these tests. It is also recommended to slowly turn over the leaves of a book, imagining while you do that you see the word "sleep" in large, black letters, printed on each page. You will turn them more and more slowly and finally cease, unconsciously, and fall asleep.

FATIGUING CONSCIOUSNESS.

With eyes closed, imagine that you are stretching a piece of elastic two inches long. Go through the actual movements again and again until you have stretched it as far as your arms will reach. One hypnotist encourages sleep in his patients by placing a cork between their teeth and causing them to bite hard on it for a minute or two. He also instructs them to shut their eyes and imagine that lemon juice is being dropped into their mouths, a drop at a time. This causes an increase in saliva and it is claimed produces a soporific effect at the same time.

If these methods fail he requires the subject to roll his tongue back in the mouth and hold it steadily by pressing it against the palate. It is also claimed that sleep can be induced by rolling a small rubber ball or large marble between the hands and imagining that you can see it roll. A more common method is to instruct the subject to breathe deeply and rapidly "sixty-three" times, bearing the idea in mind that the sixty-third breath will find him asleep.

In daylight laboratory tests a physician who employs hypnotism for therapeutic purposes gives his subjects a pencil and a pad of blank note paper and instructs them to write the word "sleepy" very slowly "thirty-three" times. They are told to close their eyes for a moment after writing the word each time. When they have written the word thirty-three times, and if still awake, they are to sit with eyes closed.

All of these methods are actually prescribed by practical hypnotists. Even the most powerful specialists practicing this science resort to such preliminary means for inducing sleep. Any of the above methods can be applied by one's self.

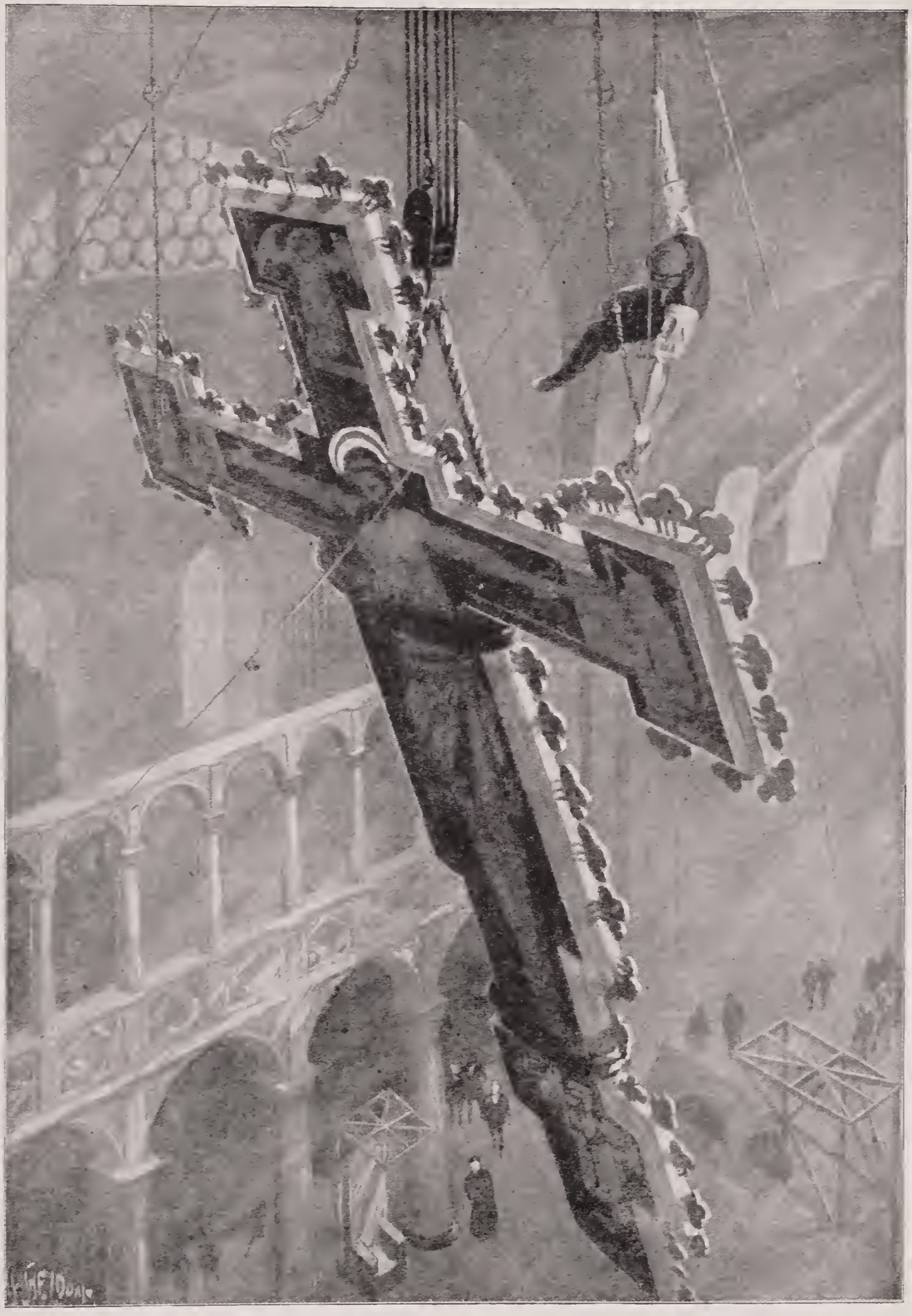
INDUCING SLEEP IN OTHERS.

Others, more interesting, can better be applied to a second person. Most any wife or mother can induce sleep in her wakeful husband or child by employment of amateur hypnotism, unless his insomnia be acute.

Of course no levity must be shown, lest lack of confidence result, and this will be fatal if present in either the operator or the subject. "Anyone willing to try can make a hypnotist of himself, if gifted with ordinary tact, determination and judgment," a successful master of this art once told the writer by way of introduction to a lesson in hypnotism.

Take the photograph of some striking person unknown to your wakeful subject. Tell him that it is the portrait of one of the greatest hypnotists in the world, and that if he will gaze into its eyes he will feel their influence and soon drop into a sound sleep, lasting until morning. This is a method sometimes used in stage seances, and many subjects will follow the suggestion at once.

The sleep having been induced you can tell your subject that when you arouse him in the morning you will present him with a card; that he will read what is written thereon, and that ever afterward he can



Hanging the great cross in the New Westminster Cathedral, London, England.

make himself sleep by gazing at the same card, if undressed and in bed. Then prepare a card reading something like this: "Ten minutes after reading this you will drop into a sound sleep, and sleep just as long as you wish." "Show him this card at any future time and he will carry out the suggestion," says the hypnotist who devised the test.

Another method recommended is this: "Require your subject to hold both of his hands, backs facing him, about six inches in front of his face. He must then stare at each of his finger nails in turn while he counts ten slowly. He should commence with the left little finger and work to the right. A good subject will seldom keep his eyes open until he has gazed at the whole ten nails."

Some professional operators employ a little electric lamp, which when grasped tightly in the hand is lighted, but which goes out when the hand's grip is relaxed. The subject is given one of these to hold, being instructed to grasp it firmly and rivet his attention upon the bright light. The hypnotist, standing over the subject, suggests that the latter's eyes are growing tired and that with this effect the hand will relax; that finally when the light goes out the eyes will close in sleep. Of course, the hand relaxes from fatigue. The light extinguishes itself and the subject really sleeps as a result of the suggestion.

QUACKERY IN MIRACLES OF HEALING.

Quacks have two advantages over regular practitioners. In the first place, all the quack's successes are trumpeted abroad by his grateful patients, while of his failures the world hears nothing, since no one likes to confess the silliness—when it has been shown to be silliness—of having had recourse to a charlatan. Secondly, only those have recourse to a charlatan who implicitly believe in him, and this implicit belief is itself the chief, or even sometimes the sole factor in the cure of many complaints.

There recently appeared in the papers this striking example of the power of the mind over the body, which, I think, lets in light upon a multitude of "miracles," attested by overwhelming evidence, yet doubted because they were attributed to supernatural power. "At 1 a. m. on July 14 Pat Shay, who for four years past has suffered from paralysis of both legs, compelling him to walk on crutches, was dragging himself to the lodging house where he was staying near the Dials, when he saw smoke belching forth from a bird and dog fancier's shop in St. Andrew street. Promptly Shay gave the alarm, and in quick time a man, who happened to be close by, answered to the call. Between them they managed to burst in the door. Then, in his intense excitement, the cripple forgot his infirmity, and, throwing away his crutches, rushed with his companion up the burning stairs. Seizing an infant boy whom he found in a room, Mr. Shay rushed downstairs with him.

" 'When the police and firemen arrived,' said Mr. Shay in his account of the matter, 'I was knocked over in the struggle just after I had brought the boy down. Some one standing by who saw me helped me up, saying, "There's your crutches." "I don't want the crutches," I answered,

and neither did I. I could walk without them. I saw the finish of the fire, and then went home, carrying the crutches under my arm. I can hardly realize it myself. It's nothing short of a miracle.' "

NOTABLE INSTANCES FROM HISTORY.

Few events in history are so well attested as the miracles wrought upon the tombstone of Deacon Francois de Paris in the churchyard of St. Medard, and yet they were derided by the Jesuits, because they were Jansenist miracles; by the Protestants, because they were Catholic miracles; by the doctors, because they were quackery; and by the scientific, because they were assumed to be supernatural. Yet medical men and men of science, Protestant, Catholic, and Jesuit, would one and all have admitted the evidence for some of the most startling of these miracles to be overwhelming if their creed, or calling, or training had not prejudiced them against all evidence. The tombstone not only cured neurotics but inspired the convulsionaires that stood or lay upon it with supernatural eloquence, or knowledge, or endurance.

At last, through the influence of the Jesuits, and by royal decree, the churchyard was closed. This, however, only changed the venue of the miracles, since a few grains of earth from the grave sufficed to produce all the phenomena in whatever place the convulsionaires assembled together for a seance. Today doctors and men of science admit the phenomena, but attribute them to hypnotism; but hypnotism itself, under its original name of mesmerism, was laughed to scorn only a generation since by doctors and men of science. Ultimately they will come to admit that hypnotism, clairvoyance, etc., are all alike manifestations of some mode of interaction of mind upon mind, as natural as wireless telegraphy.

IMAGINATION MAY KILL OR CURE.

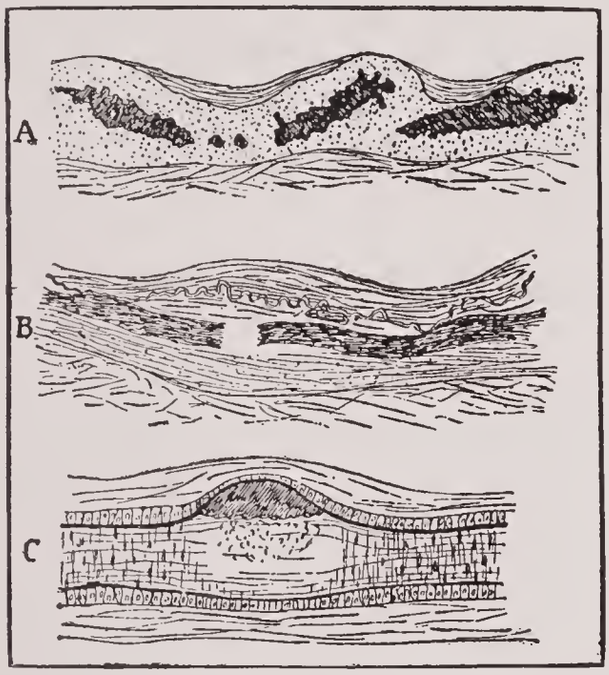
Imagination is quite as effective to kill as to cure. I remember a year or two since reviewing a book by a medical expert in mental disease, who quoted without comment the following monstrous case of scientific homicide: Two physicians walking and talking together in the outskirts of Edinburg stopped to illustrate the subject of their discussion experimentally upon a laborer who was working in a field by the road. The senior doctor, who was so famous in Edinburg as to be known to the laborer, thus addressed him: "My good man, you've no business to be at work, or to be out, or to be anywhere but in bed. Allow me to examine you." Having looked at his tongue, felt his pulse, and sounded with a stethoscope his lungs, the doctor shook his head ominously and ordered the man to go home and to bed forthwith. The man, who was in perfect health, went home and to bed—from which he never rose. He was dead within a week.

CAUSE OF DEATH FROM OLD AGE.

There is a disease to which all of us must in some degree submit if we reach old age—arteriosclerosis, the "rust of life." This infirmity, old as man, develops slyly among the histological elements constituting the walls of the arterial vessels,

and leads to the physical decay of our most delicate organs.

Arteriosclerosis is characterized by a circumscribed or diffused thickening of the arterial walls, and it forms in the great arterial trunks more or less numerous plates, isolated or confluent, frequently cartilaginous in appearance and infiltrated with calcareous salts, among which those of phosphate of lime and lime have the principal place. In the small arteries and in the capillaries the



A. Decaying Artery.
B and C. Rusting out of the veins.

sclerositic process may reach the point where it transforms the walls into a fibrous and compact tissue which produces the sensation to touch of a rigid cord. If we except the gravest forms of the trouble, it appears that arteriosclerosis leads to a loss of activity in the great arteries and to a diminution in the caliber and occasionally even to the obliteration of their last and finest ramifications.

Two sorts of causes intervene in this disease, on one hand being ranged chronic poisonings and on the other the age of the body and the mistreatment of the arterial walls by overwork. We can therefore conclude that arteriosclerosis is a disease universally present among people of a certain age and difficult to avoid.

As we said above the deposits of calcareous salts, and particularly of phosphate of lime—a composition insoluble in distilled water, but soluble in an aqueous solution of chloride of sodium, of phosphate of soda, or of phosphate of magnesia—constitute the principal factor of arteriosclerosis. Now Bunge, who demonstrated the richness of young mammals in chloride of sodium, also showed that with age this reserve of salt diminished, and it is therefore natural to suppose that arteriosclerosis is the natural consequence of the insufficiency of chloride of sodium in the organic liquids. In fact, the treatment conceived by Trunecek to remedy this insufficiency has given encouraging results.

The inorganic serum of Trunecek is obtained by dissolving in distilled water the different salts composing the mineral part of blood serum, but in proportions ten times greater than normal, the formula being sulphate of soda 0.44, sulphate of potash 0.40, chloride of sodium 4.92, phosphate of soda 0.15, carbonate of soda 0.21, distilled water 100.00.

WHY OLD AGE KILLS.

The few scientific men who have earnestly pursued this interesting phenomenon of senile death are agreed that most animals and reptiles which live to great ages are capable of discarding their old skins or shells and that they become rejuvenated after assuming those coverings which

are not popularly supposed to be vital to the wearer. It is a fact, explain the scientists, that the skin, shell, or hide of all creatures is the final repository for the waste of the system. Here is accumulated all of those substances not necessary to the subsistence of the creature which consumed them, or not assimilated by the active organisms of the body. In these castoff skins, shells, and hides of creatures most noted for longevity, there lie, according to good authorities, all of those wastes which the healthy system should exclude, and in them are contained those influences which make for an untimely death unless the vehicle is sloughed off, discarded, or renovated.

E. J. Kibblewhite, a noted English scientist, addressing himself to this phase of the question of human longevity, says:

"Ninety-five per cent of the organic matter we take into our bodies, as food, remains therein, in combination with sulphur and five per cent of mineral matter —sodium chloride, silica, calcium phosphate, carbonate, and traces of iron and lead. These build up the body, up to a certain age—more or less satisfactorily, as we feed, or as our inherited constitutions enable us to assimilate the food we take. Beyond that age, they accumulate in quantities which the body cannot dispose of: and all ordinary attempts to remove them fail, just as the careless engineer fails who does nothing but pour oil into his engine clogged up with dirt.

LIFE'S ENGINE CLOGGED BY WASTE.

"Dissolve this dead waste out of the body, and the blood will do its work again effectually, renovating the living parts as in youth. Otherwise it goes on accumulating, gradually blocking up the drain-pipes of the body, and hindering the excretion of waste material that the healthy skin action of youth promotes. Hence, as men grow old their skins gradually harden, and become like parchment, filled with the indurated cement-like deposit which can be felt if you pass your hand over the flesh of an old man. Such a man having escaped the ordinary diseases of humanity, most of which are merely the quicker results of the same thing, dies, as we say, of 'old age.'

"That man ought not to die, if we can clean him and set him going again, just as we can a well-made and well-preserved watch or engine, the moving parts of which are still well preserved, and which are simply clogged by dirt. The man's moving parts are good. We repeatedly read the statement by medical men at inquests of such that 'all the organs seemed perfectly healthy.' Such men die because a slight cold or some similar accident stops the engine, which, if it had not been fouled throughout by waste, and its exhaust sealed up, would have overcome the temporary stoppage.

ACID RENOVATES HUMAN SKIN.

"Sixteen years ago, after a good deal of previous inquiry had been devoted to the subject, my attention was directed to the use of a glacial acetic acid, solid at 50 degrees, as a means of dissolving the dead waste out of the skin. I found that in the proportion of three parts of the acid to one of water for the legs and arms, and five parts of the acid to one of water for the more tender parts of the body, it dissolved out the waste clogging the skin,

bringing it away, till the renovated skin below was like that of a child.

"My method was, after the hot bath, before retiring at night, to shampoo the body vigorously with the acid and water by means of a small sponge for ten minutes or so, till the flesh tingled, and then to get into bed still damp. I found in my own case, and in that of others, that this treatment cured gout, and banished all the aches and pains of fatigue, as if by magic. In the morning I stood the feet, with my socks on, in a shallow dish with just enough of the acid and water therein to soak the soles of the socks, put on my boots, and went about my business. In a few weeks my feet were totally freed from the hardened skin which gathers on the feet of those who do much walking, and anything like a corn or callus disappeared most agreeably. Any one who follows my example intelligently will derive similar benefit.

HOPES TO PROLONG VIGOROUS LIFE.

"I do not think the treatment would be of any use to a man already smitten with any organic disease. He is booked. But I do believe that the man who is still otherwise healthy—who is going to live till he dies of 'old age,' may prolong life in renewed vigor considerably. I think, too, that many more would benefit if recourse were had to the method in earlier life.

"I am still carefully pursuing my experiments. Till recently, though convinced of the reality of the results obtained, I could not but regard them as in some degree empirical. But the discoveries of the properties of radium and kindred radiating substances seem to me to afford a clew which I am trying to follow, which I am hopeful may lead to still better things. I started sixteen years ago, and it is possible that others who avail themselves of it may arrive independently at other results even more beneficial than I think I have attained."

NATURE'S ATTEMPTS SEEN IN ODD CASES.

There are recorded cases of old men and women who have enjoyed, for no obvious reason, the return of physical youth in one way or another, though never in a complete or symmetrical manner. One toothless old man, having reached the age of 80, began the process of teething as in early childhood, and in the course of a year developed a mouthful of strong, sound teeth. Baldheaded persons of great age have experienced the sudden and unaccountable growth of luxuriant hair, and there have been instances in which, after reaching middle age, men and women have resumed growth, gaining in stature long after such processes are supposed to have ceased.

It is the theory of many doctors that these cases are evidences of isolated efforts of healthy human nature to throw off the waste accumulations of the system and that, if the process could be amplified so as to reach all parts of the body in which superfluous matter is assembled the life of the otherwise healthy subject might be prolonged indefinitely, or, at least, until some organic ailment had fastened upon the body. In other words, there is a growing faith among earnest scientific inquirers that the business of eliminating waste deposits may involve

the secret of prolonging life, since there seems to be no cause except these menacing accumulations why old persons, whose vitals are neither imperfect nor worn out, should die.

AVERAGE LENGTH OF LIFE AT DIFFERENT PLACES.

The pitiless logic of percentages, as applied to vital statistics, falls short of accounting for one fact in the census reports —the longevity of residents of the few remaining territories of the country.

Of 100,000 persons in the population of the average American community, taking the whole country through, there is just one which reaches or exceeds the age of 100. As the census computers prosaically express it, "99,999 die before that time." One in 100,000 is, therefore, the percentage of centenarians in the United States, but in Arizona it is 10—ten times as high as in the rest of the country—and in New Mexico it is 9—nine times as high as in the other portions of the United States.

Some States, Arkansas, Minnesota, Utah, Wyoming and Idaho, have no centenarians. Some States, Florida, California, New Hampshire, South Carolina and Vermont, have a high rate of centenarians—three times as large as the average in the other States, but much below the figures of Arizona and New Mexico.

There are few centenarians in New England, but the number of persons between the ages of 75 and 100 there are more than in any other section of the United States, and the two New England States which are most noted on account of their great number of old inhabitants are Vermont and Maine. Massachusetts has a considerable number, but the people of Massachusetts are generally of a more progressive character than those of the farming districts of Vermont and Maine, and urban life is not generally conducive to longevity.

The large number of centenarians in the Territories is to be ascribed, probably, to favorable climatic conditions, for both Arizona and New Mexico enjoy celebrity as beneficial in pulmonary ailments. The question of territorial organization has probably nothing to do with it.

"GROW FOOD."
DISCOVERY OF A SUBSTANCE THAT INCREASES SIZE OF ANIMALS.

Yolk of egg contains a substance called "lecithin," which, as has been newly discovered, is, in the language of the German scientists, a veritable "grow-stuff." Fed to human beings or other animals, it has a marked tendency to accelerate development of flesh-tissue and bony structure. For many years past St. Bernard pups reared for exhibitions at shows have been systematically stuffed with eggs to increase their size, but, though the process was notably effective, nobody suspected why. The reason lay simply in the lecithin contained in the yolks.

SOME EXPERIMENTS.

Dr. H. W. Wiley, the government's chief chemist, and his assistant, Dr. Max-

well, have performed some elaborate experiments with the "grow-stuff." So, likewise, have Dr. Koch, of the University of Chicago, and Dr. Danilewsky, of Paris, who have utilized many kinds of animals, from frogs to chickens, in their investigations. They found that puppies, fed with regular doses of lecithin not only grew faster than pups reared in the ordinary way, but were stronger, more lively, developed thicker and silkier hair and seemed to be perceptibly more intelligent. In order to avoid error as far as possible, the puppies were invariably taken from the same litters, some being dosed and others not, and, apart from the special treatment, were brought up under exactly the same conditions.

Dr. Danilewsky found that tadpoles dosed with lecithin grew much faster than pollywogs which did not have the treatment, while frogs' eggs placed in water containing one fifteen-hundredth part of the substance gained in fifty-four days 300 per cent more in weight than other eggs of the same batch in ordinary water. In other words, the lecithin eggs grew four times as fast. Similar results were obtained by Prof. Shinkishi Hatai, of the University of Chicago.

ON RATS AND GUINEA PIGS.

Dr. Koch tried the "grow-stuff" upon guinea pigs and rats. Having boiled the lecithin in distilled water to make it sterile, he administered it to the animals through the mouth and by injecting it beneath the skin, in different series of experiments. The animals under trial were invariably of the same litter, were fed on the same kind of food (a plain vegetable diet of corn, carrots and cabbage), and were weighed every two days. Taking an average, it was found that the lecithin rats grew 60 per cent faster than the rats reared in the ordinary way, and it was about the same with the guinea pigs.

The results obtained by Dr. Koch indicated that the "grow-stuff" worked better when given by the mouth than when administered hypodermically. This ought to be considered fortunate, inasmuch as children, if their growth is to be encouraged by such means, will find it much easier to swallow the doses than to take them in the other way. Dr. Danilewsky found that doses given once in five hours served the purpose with young chickens, the development of which was markedly accelerated by the medicine, but as yet the trials have not been extended to babies, and much remains to be learned in regard to the best methods of treatment for growing boys and girls.

A BRAIN FOOD.

One of the most interesting conclusions drawn by Dr. Danilewsky is that lecithin acts upon the brain. Indeed, it seems to be actually a brain food. Its influence as a stimulant is exerted directly upon the blood, which is thereby caused to deposit the materials that build the bones and other tissues of the body. Of course, all the material that goes to make growth is originally in solution in the blood, from which it is deposited in the form of bone, muscle-tissue, etc. If, while growth is still going on, the rate of deposition can be accelerated, the human being or other animal will grow faster. Apparently, this is the way in which the lecithin works, by stimulating normal growth.

PHOSPHORUS.

Lecithin is defined by Dr. H. W. Wiley as a fat in which phosphorus has replaced part of the hydrogen. In simple language, it is an organic compound of phosphorus. While egg-yolks contain an extraordinary percentage of it, it is found also in seeds, wherein it is stored to furnish material for the growth of the embryo plant—just as in the egg it helps the development of the unhatched chick. It is, in fact, nature's own "grow-stuff," and occurs wherever food is stored for the use of the embryo plant or animals. From it, Dr. Wiley says, we mainly derive the phosphorus which helps to nourish the brain, nerves and other tissues of the body.

Drs. Wiley and Maxwell have performed some interesting experiments with eggs to find out what becomes of the phosphorus in the lecithin of the yolk. It was a difficult problem of chemical analysis, but its solution proved that during the process of incubation the organic phosphorus of the lecithin is transformed into the inorganic phosphorus of the bones of the chick. This was ascertained beyond question by analyzing first the fresh egg, and afterwards analyzing a newly-hatched chicken.

WILL IT MAKE GIANTS?

The process by which a human being or other animal grows is somewhat of a mystery, and nobody knows why development comes to an end at a certain stage of life. It is supposed that an alligator continues to grow throughout its entire life, and the same may be true of some other reptiles, but the growth period of a mammal is usually limited to about one-fifth of the term of its natural existence. If development during that period can be accelerated, the size of the animal at maturity will be greater. Hence it is thought that children judiciously dosed with lecithin may in this way be made to grow taller and more muscular. Perhaps, indeed, by this simple means we may yet be able to create a race of giants.

MILK THE FIRST FOOD OF ALL MAMMALS.—GOVERNMENT INSTRUCTION AS TO ITS PURITY.

The souring of milk is due to the action of minute organisms known as bacteria. These bacteria are so minute that they can be seen only by the aid of a powerful microscope, but the result of the concerted action of myriads of them in souring milk is a familiar sight to every housewife. Besides the ordinary souring of milk, there are many other changes which may take place—as the ripening of cream, the ripening of cheese, butter becoming rancid, and many others less common.

These changes are called fermentations, because they are similar to the fermenting of cider to vinegar, the fermentations produced by yeast in beer making, etc. The term includes many changes due to other micro-organisms or ferments besides bacteria; and so here fermentation is used to cover all the changes which occur in milk, such as curdling, souring, and putrefaction, most of which are caused by bacteria. The great importance of these fermentations of milk is being realized. It is only by a proper con-

trol of them that good butter or cheese can be made.

SOURCES OF BACTERIA IN MILK.

It has long since been ascertained beyond question that pure milk, drawn from a healthy cow, contains no bacteria, and that all bacterial contamination of the milk comes from external sources. While this fact has been redemonstrated by the most recent work, it has appeared that the statement must be for practical purposes quite considerably modified. In the first place, the difficulties which lie in the way of obtaining milk from the cow without bacterial contamination are extremely great and sometimes seemingly insurmountable. Of the many attempts which have been made to obtain milk in this way which shall from the first be sterile, most have proved failures. Enough of them have met with success to demonstrate the general position; but so many of them have been unsuccessful as to show the extreme difficulty of obtaining sterile milk in this way. In spite of cleanly methods, of sterilized vessels, and of the greatest care to prevent dirt and dust from falling into the milk, the milk when first drawn from the cow has in the large majority of cases contained bacteria. The explanation of this fact has proved to be in the ease with which the milk is contaminated in the milk duct. The milk duct is, of course, open to the air, and it will contain at the close of the milking a considerable amount of milk adherent to its walls. Bacteria from the air have no difficulty in making their way into the duct, growing there, and becoming extremely numerous. The result is that by the time of the next milking the milk ducts contain bacteria in great numbers, and these will inevitably contaminate the milk. It has been suggested that the bacteria not only enter into the milk ducts between the milking, but that some of them actually make their way into the very depths of the milk gland itself, and there grow and multiply. Undoubtedly the milk gland of the healthy cow produces milk which is uncontaminated with bacteria, but the large caliber of the milk duct makes it possible for the bacteria to grow in the duct to considerable extent, so that it becomes a matter of extreme difficulty to obtain milk from the cow, even with the greatest precautions, which shall not be contaminated.

THE AIR NOT A HOME FOR BACTERIA.

Of late the air has come to be regarded as a less important source of contamination than formerly. It is of course true that milk does receive some bacteria from the air during the milking. In an ill-ventilated stall, filled with dust from hay, bacteria will be floating in the air. When the milking occurs quantities of dirt and dust are brushed from the undersides of the cow's body and fill the air in the immediate vicinity with bacteria; but such contamination is to be charged to the hay or dirt on the cow rather than the air.

The milk vessels themselves are an important source of contamination, as are also the hands and clothing of the milker. The milker seldom makes a cleanly toilet before milking, and any dirt upon his hands or upon his clothing will have abundant chance to get into the milk vessels. The ordinary water in which the milk vessels are washed, and especially

Robbing the Evil One of power: The annual 1st of August exorcism in the Val di Rose of Italy. On the 1st of August every year the people of Val di Rose gather in the great square, which is also the public threshing-floor. The most intelligent man of the community is elected head of the people, and officiates at the ceremony. He solemnly attaches a puppet representing the devil to a small fire-balloon, which is liberated amid popular acclamation. The peasantry believe that for the rest of the year the Evil One will neither disturb their dreams nor damage the vintage.

with which the milk is too frequently diluted, is also regarded as a very important source of bacteria contamination, particularly in connection with certain disease germs, like those of typhoid fever. But a more careful consideration of the work of the last few years shows that the great sources of bacteria contamination are from the cow itself, not, as we have seen, from internal, but from external sources.

HANDLING OF MILK.

To those dealing with milk itself in any form the various fermentations are especially undesirable and are constant sources of trouble. Such persons want the milk pure and sweet, and any of the various forms of fermentation injure the milk for their purposes. Our study of milk fermentations has taught us that the cause of all these fermentations, even the common souring, lies in the contamination of the milk from without, and that the remedy lies in the exercise of extreme cleanliness. If there has been anything taught in regard to these matters it is the extreme necessity for cleanliness. Poor milk, poor butter, and poor cheese are, in a vast majority of cases, to be attributed to uncleanliness in the barn or dairy. The great source of bacterial contamination of the milk is *the cow herself.* This does not mean the bacteria from the mammery gland, but those connected with the exterior of the cow. It is true that there are other sources of importance. The food that the cow eats (indirectly), the cow stall itself, the water with which the cans are washed or with which the milk is adulterated, the hands of the milker as well as his clothes, are all occasionally the sources of bacteria contamination. But after all we must look upon the cow herself as the cause of the most trouble. From the cow the bacteria get into the milk during the milking, partly from the milk ducts, partly from the dirt that is attached to the cow, and in no small measure from her dung. We thus learn that the important point toward which to direct the cleanliness is the cow herself. The farmer never appears to feel that it is necessary for him to keep his cows as clean as he does his horse. But there is very much more real need for cleanliness in the case of the cow. Upon such cleanliness will depend his ability to obtain a pure, wholesome milk, while so sure as he allows his cow to become covered with dirt and manure so sure will he be liable to have trouble with the milk. So it is well to repeat that the last few years have taught us, above all things, that the great secret of obtaining a proper supply of milk is to have a *healthy cow and to keep that cow clean.*

WHAT TO DO IN TIMES OF DANGER.

TREATMENT OF CUTS AND FLESH WOUNDS.

The prime consideration that confronts one in the treatment of cuts and flesh wounds is the ever present danger of blood poisoning.

In dealing with a flesh wound keep clearly in your mind the fact that poison germs are everywhere—in the atmosphere, in the patient's clothes, on his flesh, on your own hands and in the water with which you may be tempted to wash

the wound. Do not, however, use water to wash the wound. If an artery is not severed and there is no immediate danger of bleeding to death take a clean cloth or handkerchief or a piece of absorbent cotton and use the flow of blood to wash out whatever dirt may have got into the wound at the time of the accident. On no account touch the wound with your hands unless it is necessary to use finger pressure upon a spot where an artery may be severed. Then as quickly as possible place a pad of absorbent cotton or gauze or clean muslin in the wound and bind it up firmly, keeping the thought steadily in your mind that every moment the wound is exposed it is being poisoned by the germs in the atmosphere.

If the wound is in either of the limbs and is bleeding profusely lay the patient flat and elevate the wounded limb.

If the bleeding comes in jets and spurts you may know that an artery has been severed. In this case first local pressure should be used—that is, place your finger firmly upon the spot from which the blood is spurting; then place a clean pad on the wound and bandage as already directed. If the bleeding is not arrested it may be necessary to apply distant pressure—that is, at a point between the wound and the heart on a line followed by the great arteries from the heart to the wound.

If the wound is in the head or neck the carotid artery must be compressed against the vertebral column on either side—the pressure being made with the thumb inward and backward, behind the windpipe, and on a level with the larynx.

If the wound is in the upper limbs—high up, near the armpit—pressure must be made in a downward direction behind the collar bone.

If the wound is in the lower arm or hand the pressure must be applied to the inside of the upper arm on the line at the base of the biceps muscles.

If the wound is on the leg apply the pressure in the center of the groin and press straight back against the bone until the blood stops.

As pressure with the finger and thumb cannot be maintained for any length of time, a tourniquet of some kind must be devised. This may be done by tying a handkerchief loosely around the part where the pressure is to be made, then put a hard pad, such as a cork, upon the part where the pressure is to be applied. Draw the handkerchief or strap over this hard pad and create pressure by placing a stick or handle of a knife between the flesh and the handkerchief and twist it round and round until you have obtained sufficient pressure to arrest the bleeding.

After the bleeding has ceased it becomes necessary to dress the wound and place the severed and lacerated flesh snugly back to its normal position. At this point, however, it is well to suppose that the patient is in the hands of a surgeon and no more need be said. But it may happen that an accident takes place where the services of a surgeon are not readily available. Then it must be remembered that cleanliness and only cleanliness is the thing to be considered. The greatest surgeon in the world can do no more than place the edges of the wound together, either by stitches or otherwise, and see to it that the wound is clean and everything coming in contact with the wound is surgically clean, which is the

superlative degree of cleanliness. Nature does everything else. Never attempt to put plasters or lotions or powders upon a wound to accelerate healing. Nature cannot be improved upon in this respect.

In treating cuts and flesh wounds there is only one thing to remember and that is the word "clean." Never let it leave your mind for an instant. Death or serious consequences can only follow a flesh wound when this word is forgotten.

RULES IN CASE OF FIRE.

Crawl on the floor. The clearest air is the lowest in the room. Cover head with woolen wrap, wet, if possible. Cut holes for the eyes. (Don't get excited.)

Familiarize yourself with the location of hall windows and natural escapes. Learn the location of exits to roofs of adjoining buildings. Learn the position of all stairways, particularly the top landing and scuttle to the roof. Should you hear cry of "fire," and columns of smoke fill the rooms, above all keep cool. Keep the doors of rooms shut. Open windows from the top. Wet a towel, stuff it in the mouth, breathe through it instead of nose, so as not to inhale smoke. Stand at window and get benefit of outside air. If room fills with smoke keep close to floor and crawl along by the wall to the window.

Do not jump unless the blaze behind is scorching you. Do not even then if the firemen with scaling ladders are coming up the building or are near. Never go to the roof, unless as a last resort and you know there is escape from it to adjoining buildings. In big buildings fire always goes to the top. Do not jump through flame within a building without first covering the head with a blanket or heavy clothing and gauging the distance. Don't get excited; try to recall the means of exit, and if any firemen are in sight don't jump.

If the doors of each apartment, especially in the lower part of the house, were closed every night before the occupants retired there would not be such a rapid spread of flames.

HOW TO KEEP FROM BEING DROWNED.

"Don't go near the water till you have learned to swim" is old advice, but something more practical is needed for bathers and sea-travelers.

"The first piece of advice I would give to bathers," said a veteran of the life-saving service, "is: Don't go far from shore. Swimming is one of the hardest exercises in the world, and a man must be well used to it. No matter whether he is as fit as a fiddle to run a five-mile race in record time, let him be careful how far he tries to swim.

"Every muscle is used when a man is swimming, many of them that are never brought into play in any other way. This is the main reason why so many fellows get into trouble every year.

"They feel good and strong, and when they get into the water they swim and swim until they get tired. Then when they try to swim back again their strength plays out, and if help isn't near by they get rattled. The next day the newspapers have another account of 'An Expert Swimmer Drowned.'

"Getting rattled is another thing to guard against. Nine times out of ten this

has more to do with people getting into trouble than anything else. Whatever you do or wherever you are, keep cool—keep your nerve. A man can stay afloat a long time if he won't get rattled, no matter what's the trouble with him.

"There's a spot just off Norton's Point where you can't make headway in one direction or the other. If you are caught in there with a boat you can't pull out, so you can have an idea of what kind of work a swimmer has cut out for him. There is only one thing to do, and that is to keep cool and quiet, and after a while the current will carry you out, but you can't get out by swimming. That is what we call a 'sea puss.'

"In a race I had once some years ago from the Battery to Coney Island I got caught in this place. I knew it the minute I reached it, so I didn't try to swim, but turned over on my back and floated.

"In the course of a few minutes I was whirled out, and went on and won my race. Now, an inexperienced swimmer would have got rattled, made big efforts to get out, and finally have tired himself out and sunk.

CRAMPS.

"Don't be afraid of cramps is another thing that all swimmers should remember. There has been so much said and written about cramps that people are scared to death when they feel a little cramp coming on in a toe or hand. Then they lose their nerve altogether and give up, where by being cool they could have made their way to shore in safety.

"Lots of the pleasure of bathers is taken away by this fear. I won't say that cramps are not slightly dangerous, but they are never so bad that a swimmer can't take care of himself. Swimmers with any kind of ability ought to be able to swim any reasonable distance with any kind of a cramp. The ones who are not good swimmers should always hug the shore and never take chances.

"Cramps are brought on by swimming. So when you feel one coming on stop using the leg or arm where it is located. If you turn over on your back and float a while that will give the cramp a chance to go away, but even if it doesn't it won't prevent you from swimming slowly and getting to shore.

"Most people think a cramp spreads gradually until it goes all over the body from a little cramp in the toe. This isn't so. It is always confined to the leg or arm, where it starts. This is proved by the fact that it goes away when you quit using the leg or arm.

"I have never yet been in a swimming race for a long distance that I haven't had a cramp in a leg or arm. I got one in my right leg one time so bad that the leg locked at the knee-joint every time I made a kick. Yet I not only finished the race, but won it.

"Whenever you hear cramp stories some one is sure to mention stomach cramps. They are supposed to be the most dangerous kind. You hear where people are doubled up like a jack-knife and then sink like a stone. Now, as a matter of fact, in all my experience I never had a stomach cramp or saw a person with one.

"If they ever happen they have kept out of my sight. And I don't believe there is such a thing. This is another fairy story that has been told until everybody believes it. So that when a fellow

in swimming gets a little pain in the stomach he at once imagines he has stomach cramps, and that he's a goner, and will at once yell for help or do something foolish.

"It's nearly always the poor swimmer who gets into trouble, for he is the one to take the greatest chances. Good swimmers always travel in pairs, so they can aid one another in case of trouble. You often see the head of one of these poor swimmers bobbing about way off shore, although we try our best to keep them in, and when one of them gets into trouble he is usually so far out that he is gone before we can get at him."

PANICS.

Panic is man's greatest enemy and destroyer. It bloats ordinary accidents into great disasters. It is the annihilator of common sense and the last vestige of reason. In the twinkling of an eye it turns men into brutes, making them mad with unreasoning terror. It even transforms brave men into the most arrant cowards.

Panic, according to dictionary definition, is "a sudden fright; especially a sudden fright without real cause, or terror inspired by a trifling cause or misapprehension of danger."

Fear causes its victim to reason out ways of escape from the impending danger. "If I don't find a way out of this," says the man caught in a burning building, "I fear I'll be burned to death." Reason still guides the man who fears, and usually guides him to safety.

HOW PANIC OPERATES.

But panic is infinitely worse. All barriers go down before it.

A little puff of smoke, and a whole audience is madly scrambling for the exits of the theatre, the weakest being knocked down and trampled under foot and killed, the dead and injured piled in heaps at the choked-up exits, that, had the crowd been orderly, would have permitted of the passage of all to safety before real danger threatened those in the rear. What killed the majority of the victims in the Iroquois Theatre horror? Some of the occupants of the upper gallery were suffocated by the heat, but as for the rest, the heaps of bodies before the exits and the bruises on the corpses showed that not fire or smoke or heat, but panic, claimed their lives.

A girl in a tobacco factory in Philadelphia runs a needle into her finger. She screams from the pain. Instantly the 200 workers on her floor spring up as one girl, rush blindly down the stairs and jump from the third-story windows, and a half-dozen lives are sacrificed and two-score or more girls injured.

A steamship meets with an accident, perhaps slight, perhaps serious, but not so serious that the passengers can not be got off in safety in plenty of time, provided order is maintained. But a woman swoons, a man grows excited over some unusual happening on the deck, he rushes wildly at the lowering lifeboats, and the useless sacrifice of life has begun.

DISASTERS OF THE PAST.

Throw back your mind to past disasters of recent years—include the Paris Bazar fire horror, where strong men, in their panic, beat women back into the flames—and I daresay you will recall vividly the fact that the word panic oc-

curred again and again in the accounts—that panic, according to eye witnesses and the authorities, caused the greater part of the loss of life; that, without panic, the majority of the victims would surely have escaped with their lives. And you can hardly read of small accidents without running across "panic." "Fierce Drug Fire—Blaze in Store Starts a Panic on the Floors Above." "Killed in Blow-Up—Panic in Dye Works." Panic is the god of most disasters, great and small.

PANIC A POSSIBILITY EVERYWHERE.

Panic is a possibility everywhere at any time where two or three are gathered together for any purpose whatsoever. And because it feeds on nothing or a triviality, because it robs fear of reason where fear is well founded, it is the most difficult thing with which firemen, policemen, and other civic regulators of order have to cope.

There is apparatus plenty with which to fight fire. But there is only one thing to pit against panic. That is a cool head, and its efficaciousness is limited. It can at best save only its owner and those in the immediate vicinity. It can reduce the death list, but it cannot prevent it. Therefore, no general rule can be laid down against it. Only guidance for the individual is possible of outline.

THE GREAT PRECAUTIONARY RULE.

The great precautionary rule is this: If any member of your family is going to the theatre, a musicale, or any sort of public gathering, take particular pains to impress upon him the supreme importance of keeping his seat in case anything causes the audience to rush pell-mell for the exits. Drive it home hard that the seat must be kept by all means during the first mad rush and until the crush has swept past.

By that time your wife, or son, or daughter will have had time to think out coolly a means of escape, and will undoubtedly effect it, if you have also insisted upon the pleasure-goer becoming familiar with the location of the different exits as soon as possible after entering the building.

In case of a theatre, or other public meeting place, this can be very well done by studying the diagrams of the place, which are required to be exhibited upon the programs and in the lobby. These diagrams mark the fire escapes and the exits. Men, in this matter, can equip themselves more fully than women. For example, if they are attending a theatre, before the play begins they can walk around back of the seats, locating by eye the various ways of escape. Of course, such a method is hard for women to pursue. But a close study of the diagrams will be extremely effective, depend on that.

WHEN PANIC STRIKES.

This, then, is the first thing to do to combat panic—to be prepared for it. Then, when it comes, keep cool. If you can do that, more than likely you can keep those around you cool. Speak to them in a quiet, even, commanding tone. "Keep cool," tell them. "Keep your seats. Stay out of the crush. You'll get hurt. Keep your seats, I say. Don't you see that we'll get out all right if you'll just keep your seats and keep cool."

Your words will undoubtedly have the desired effect on the majority of those who hear them. But if any one shows a tendency toward panic, which may be communicated to his neighbors, don't hesitate to pull his sleeve or coattail vigorously, and gruffly command him to "sit down." The unexpected order may bring back his fleeting reason; at the least, it will give him and those about you a moment's respite from brute force that may mean the ultimate salvation of all of you.

Don't follow the mob and rush to and block up the exits. Let the wave of panic sweep by you. Then, using your reason, pick out the way that it tells you permits of probable escape. Let reason guide you there; and if you find more difficulty than you looked for still keep cool. Perhaps you have reached a window on the upper part of a fire escape, the lower part of which is licked by flames. Don't jump. Common sense has carried you in sight of the firemen. It will keep you safe until the firemen can reach you, which will be in a minute or less.

As you kept your neighbors quiet until the time came for you to effect escape, so you can lead them to a place of safety, for once you have established respect in them for you by making them obey your first command, they are too human not to follow like sheep where the stronger mind leads. This is the only efficacious method I know of to help others out of a panic.

PANIC ON THE WATER.

A panic among a crowd on water—always a possible thing in summer with so many excursion boats plying around the majority of our larger cities—should be handled in much the same fashion.

The tendency is for all the passengers to rush to one side of the boat. If such a thing occurs the rail will speedily be under water. But if you of the cool head should not permit this listing of human cargo, urge—nay, command—as many of your fellow-passengers as you come in contact with to make for the opposite rail. Point out that there they will be dry, at least, and farther away from the water which they fear.

If no one will follow you, go there alone. Stay there until the brutal fight for possession of the lifeboats is over. Stay there even when the overloaded lifeboats leave the ship's side, to sink, perhaps, with too great weight, before they are out of your sight. You will be safer by the rail.

Stick to the vessel as long as common sense tells you is proper. Then, if you have no life-preserver, remember that any frail object—a fragment of board, a piece of the ship's rail, an oar, a chair—will support you for hours in the water. All you have to do is to grasp it lightly with your hands, and you will float in ordinary cases until help comes.

You can do more. If any one is dependent on you in the emergency, you can provide him with the means of keeping afloat. Or, if you deem it better to keep your companion—perhaps your wife or your daughter—with you, then have her lightly place a hand on your shoulder while you grasp the float. Thus both of you will stand infinitely better chance of rescue than if, fighting, you had plunged headlong into the overcrowded lifeboats.

WHEN PANIC WORKS IN INDIVIDUALS.

Panic not only seizes hold of gatherings—it works in individuals. It is panic that causes this woman or that man to jump from the upper windows of a burning house, or to run shrieking through smoke and heat-filled halls, inviting suffocation, when the only reasonable thing to do, if other escape is cut off, is to stand at a window where fresh air can be had and wait for the firemen to reach you, which they generally manage to do, since that is a part of their life work.

Panic, operating in individuals, is largely responsible for hotel holocausts. Of course, carelessness on the part of guests is also somewhat to blame, for how many guests of a hotel are ever aware of the means provided for their escape? But ignorance does not preclude all hope of escape, by any means, while panic practically seals its victim's doom.

Panic—unreasoning terror; "terror inspired by a trifling cause or misapprehension of danger." You say a fire like the one in the Iroquois Theatre was not a misapprehension of danger? It certainly was, in that the audience forgot completely that fire has to burn up before it can spread out. That takes time, and in that time, if only the audience had not been possessed of a sudden fright that the fire would come out on them immediately, I believe, and others who know the circumstances fully believe, that probably every occupant of the parquet would have escaped, and many in the gallery, also.

PANIC PREVENTS ESCAPE.

Unless the whole place blazes up instantly, which is a very remote possibility, a theatre or other public place with the escapes provided according to law can surely be emptied when a fire is discovered without loss of life before the flames become really menacing, if only the audience can be made to keep its head. Any theatre in New York can be emptied in three to four minutes—ample time, for a fire cannot reach out over the audience in less time than that. If the Iroquois Theatre audience had only recognized this fact, and not blocked the exits, there would have been a far less gruesome tale to tell to the world just entering on its Christmas festival.

Your only weapon when panic surges around you is a cool head. Keep it, and the odds are largely in your favor that you will reach a place of safety. Lose it, and you throw your life away.

BOOK VI

Problems, Mysteries

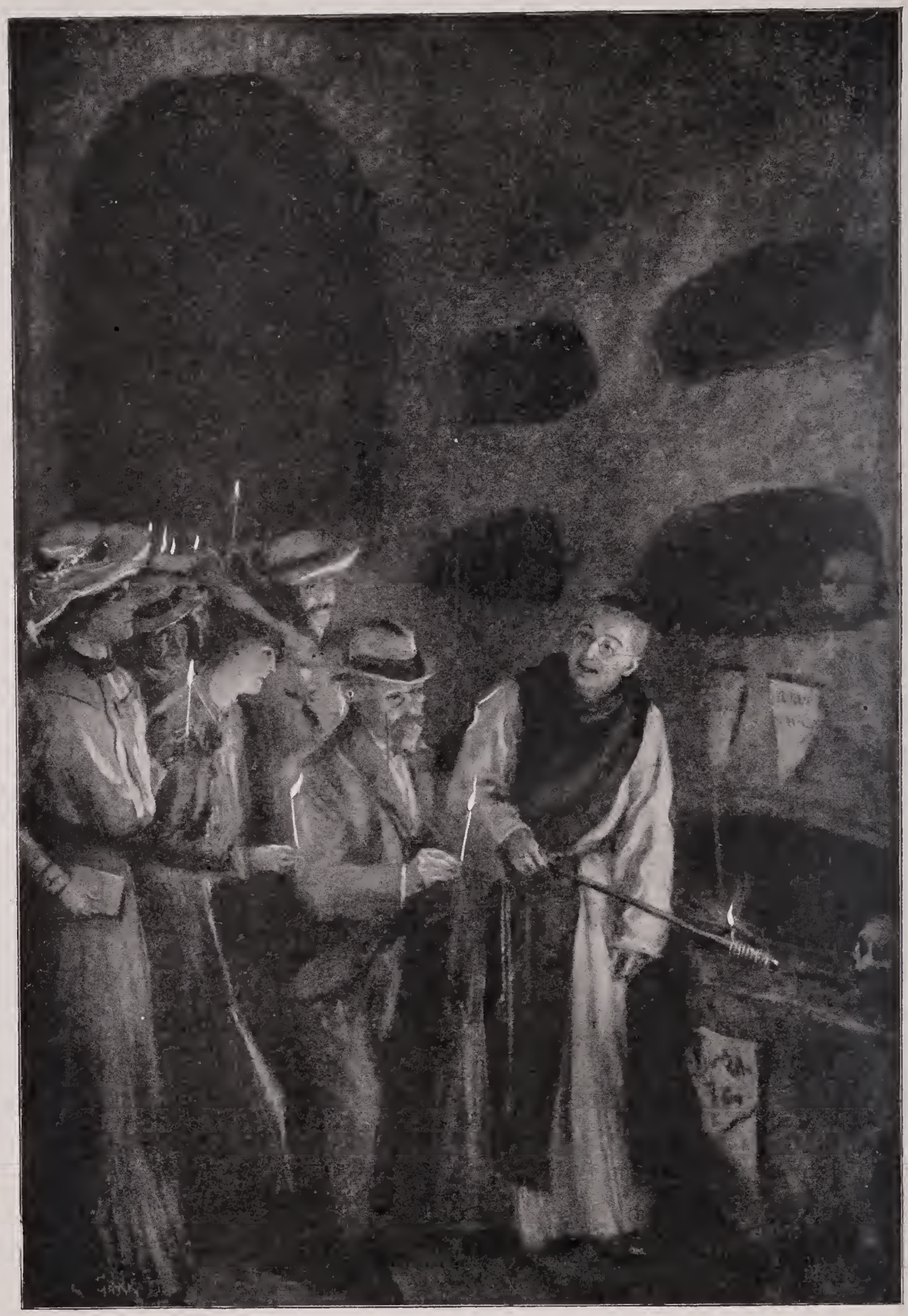
AND

Powers of Life, Mind and Soul

WITH ALL THE

STARTLING DISCOVERIES AND DEVELOPMENTS OF RECENT RESEARCH IN THE SOURCES AND MEANS OF HUMAN WISDOM AND POWER

ALL THE WONDERFUL ACHIEVEMENTS IN THE STARTLING PHENOMENA OF MENTAL SCIENCE, ILLUSTRATING THE TRUTHS FROM WHICH HAS ARISEN THE MANY BELIEFS AND CULTS OF SOCIETY



The Catacombs of Rome (forty in number) extend round the city in a wide circle covering 615 acres. If all their passages were placed in a continuous line their total length would be 545 miles.

PROBLEMS, MYSTERIES AND POWERS OF LIFE, MIND AND SOUL.

A MARVELOUS NEW SCIENCE.

THAT vast science, the new psychology, now about twenty years of age, has already become majestic, sublime, complex. Indeed, even now, it is more intricate by far than astronomy.

The discoveries now being made in the great psychological laboratories of the world are of the highest possible interest. The leading psychologists now assert that the only difference between the minds of the lower animals and man is merely one of degree only. That is, minds of men are of the same kind as those of all other animals, but many times stronger.

Careful and long continued experiments have demonstrated that even low types of animals have reason that differs only from that of man in degree.

All organic beings are mere colonies of cells—i. e., cities of individual living entities. At present it is unknown what life is, but each cell is a centre or source of life. Ganglia are nodes or collections of cells into smaller communities; and in the human brain different combinations of the same kinds of cells may produce different faculties of mind. For differing associations of the same kind of ultimate corpuscles—there is but one kind—give rise to all the phases revealed by ordinary chemistry, and by the spectroscope. The universe is made up of varying combines of life corpuscles into infinite diversity; and variations in thought, from late analyses of mind and brain, seem to be caused by varying clusters together of one kind of brain cells in ganglia.

WHAT IS MIND?

Mind is now known to be a product of brain cell activity—that is, mind is a result. Mice, birds, insects have been shown to be possessed of reason. Animals learn by experience and store this experience in memory for long periods of time. Love, affection, veneration, love of the beautiful, gratitude, conscience, consideration, contrition, sorrow, trouble, care, mercy, pity and many other attributes for long deemed to be human only are now known to be possessed by animals, in many cases to a high degree.

Several books giving thousands of instances are published. The most rigid scrutiny made by careful and conservative scientific psychologists during the last twenty years has been totally unable to detect any trace in body or brain or find any analogy in nature concerning the existence of what is popularly called the soul. Blood cells build flesh, stomach cells digest and brain cells evolve mind. Psychologists are incapable of finding any difference between the three processes. In the present state of psychic science it is not known what mind is, but whatever it may be it is known that it is caused by the action of brain and nerve

cells. When this activity ends all traces of mind come to an end. Cells that originate mind are far more complex than those that perform the office of secretion in glands. The secretion of mind is of greater complexity than the secretion of bile or gastric fluids. But all are developed by the work of cells.

Perhaps the world is now ready to receive this generalization, thus: The human mind contains no faculty that cannot be found in the minds of animals, in less degree; and in some cases in higher degree. Hence, the latest researches in mind confirm the fundamental law of nature—evolution.

PSYCHICAL RESEARCH.

OPINIONS OF THE GREAT SCIENTIST SIR WILLIAM CROOKES.

No incident in my scientific career is more widely known than the part I took many years ago in certain psychic researches. Thirty years have passed since I published an account of experiments tending to show that outside our scientific knowledge there exists a Force exercised by intelligence differing from the ordinary intelligence common to mortals. To enter at length on a still debatable subject would be unduly to insist on a topic which does not yet enlist the interest of the majority of my scientific brethren. To ignore the subject would be an act of cowardice.

To stop short in any research that bids fair to widen the gates of knowledge, to recoil from fear of difficulty or adverse criticism, is to bring reproach on science. There is nothing for the investigator to do but to go straight on; "to explore up and down, inch by inch, with the taper his reason"; to follow the light wherever it may lead, even should it at times resemble a will-o'-the wisp. I have nothing to retract. I adhere to my already published statements. Indeed, I might add much thereto. I regret only a certain crudity in those early expositions which, no doubt justly, militated against their acceptance by the scientific world. My own knowledge at that time extended beyond the fact that certain phenomena new to science had assuredly occurred, and were attested by my own sober senses and, better still, by automatic record. I was like some two-dimensional being who might stand at the singular point of a Riemann's surface, and thus find himself in infinitesimal and inexplicable contact with a plane of existence not his own.

I think I see a little farther now. I have glimpses of something like coherence among the strange, elusive phenomena; of something like continuity between those unexplained forces and laws already known. This advance is largely due to the labors of the Society for Psychical Research. And were I now introducing for the first time inquiries to the world of science I should choose a starting point different from that of old. It would be well to begin with telepathy; with the fundamental law, as I believe it to be, that thoughts and images may be transferred from one mind to another without the agency of the recognized organs of sense—that knowledge may enter the human mind without being communi-

cated in any hitherto known or recognized ways.

FACTS IN TELEPATHY.

I will confine myself to pointing out the direction in which scientific investigation can legitimately advance. If telepathy take place we have two physical facts —the physical change in the brain of A, the suggester, and the analogous physical change in the brain of B, the recipient of the suggestion. Between these two physical events there must exist a train of physical cause. Such a sequence can only occur through an intervening medium. All the phenomena of the universe are presumably in some way continuous, and it is unscientific to call in the aid of mysterious agencies when, with every fresh advance in knowledge, it is shown that ether vibrations have powers and attributes abundantly equal to any demand —even to the transmission of thought. It is supposed by some physiologists that the essential cells of nerves do not actually touch, but are separated by a narrow gap which widens in sleep, while it narrows almost to extinction during mental activity. This condition is so singularly like that of a Branly or Lodge coherer as to suggest a further analogy. The structure of brain and nerve being similar, it is conceivable there may be present masses of such nerve coherers in the brain whose special function it may be to receive impulses brought from without through the connecting sequence of ether waves of appropriate order of magnitude. Roentgen has familiarized us with an order of vibrations of extreme minuteness compared with the smallest waves with which we have hitherto been acquainted, and of dimensions comparable with the distance between the centers of the atoms of which the material universe is built up; and there is no reason to suppose that we have reached the limit of frequency. It is known that the action of thought is accompanied by certain molecular movements in the brain, and here we have physical vibrations capable, from their extreme minuteness, of acting on individual molecules, while their rapidity approaches that of the internal and external movements of the atoms themselves.

EVIDENCES OF TELEPATHIC COMMUNICATION.

Confirmation of telepathic phenomena is afforded by many converging experiments and by many spontaneous occurrences only thus intelligible. The most varied proof, perhaps, is drawn from analysis of the subconscious workings of the mind, when these, whether by accident or design, are brought into conscious survey. Evidence of a region below the threshold of consciousness has been presented, since its first inception, in the Proceedings of the Society for Psychical Research, and its various aspects are being interpreted and welded into a comprehensive whole by the pertinacious genius of F. W. H. Myers. Concurrently, our knowledge of the facts in this obscure region has received valuable additions at the hands of laborers in other countries. To mention a few names out of many, the observations of Richet, Pierre Janet, and Binet (in France), of Breur and Freud (in Austria), of William James (in America), have strikingly illustrated the extent to which patient experimenta-

tion can probe subliminal processes, and can thus learn the lessons of alternating personalities and abnormal states. While it is clear that our knowledge of subconscious mentation is still to be developed, we must beware of rashly assuming that all variations from the normal waking condition are necessarily morbid. The human race has reached no fixed or changeless ideal. In every direction there is evolution as well as disintegration.

A formidable range of phenomena must be scientifically sifted before we effectually grasp a faculty so strange, bewildering, and for ages so inscrutable, as the direct action of mind. This delicate task needs a rigorous employment of the method of exclusion—a constant setting aside of irrelevant phenomena that could be explained by known causes, including those far too familiar causes, conscious and unconscious fraud. The inquiry unites the difficulties inherent in all experimentation connected with mind, with tangled human temperaments, and with observations dependent less on automatic record than on personal testimony. But difficulties are things to be overcome even in the elusory branch of research known as experimental psychology. It has been characteristic of the leaders among the group of inquirers constituting the Society for Psychical Research to combine critical and negative work with work leading to positive discovery.

VAGUENESS OF PROOF.

It has been said that "Nothing worth the proving can be proved, nor yet disproved." True though this may have been in the past, it is true no longer. The science of our country has forged weapons of observation and analysis by which the veriest tyro may profit. Science has trained and fashioned the average mind into habits of exactitude and disciplined perception, and in so doing has fortified itself for tasks higher, wider, and incomparably more wonderful than even the wisest among our ancestors imagined. It has ascended to a point of vision far above the earth. It is henceforth open to science to transcend all we now think we know of matter and to gain new glimpses of a profounder scheme of Cosmic law.

An eminent professor of psychology declared that "by an intellectual necessity he crossed the boundary of experimental evidence, and discerned in that matter, which we, in our ignorance of its latent powers, and notwithstanding our professed reverence for its Creator, have hitherto covered with opprobrium, the potency and promise of all terrestrial life." I should prefer to reverse the apothegm, and to say that in life I see the promise and potency of all forms of matter.

In old Egyptian days a well-known inscription was carved over the portal of the temple of Isis: "I am whatever hath been, is, or ever will be; and my veil no man hath yet lifted." Not thus do modern seekers after truth confront nature—the word that stands for the baffling mysteries of the universe. Steadily, ununflinchingly, we strive to pierce the inmost heart of Nature, from what she is, to reconstruct what she has been, and to prophesy what she yet shall be. Veil after veil we have lifted, and her face grows more beautiful, august, and wonderful with every barrier that is withdrawn.

SCIENTIFIC EVIDENCES FOR THE EXISTENCE OF MAN AND GOD.

The proof of the existence of God is precisely the same in kind as the proof of the existence of a man, except more extensive and stronger. It may be that neither one exists, but if there is reason to believe that men exist there is the same reason, only stronger, to believe in the existence of God.

An old and much-venerated book has said: "If a man loveth not his brother, whom he hath seen, how can he love God, whom he had not seen?" But the truth is no man has ever seen either his brother or God. A man's body is not the man. It is the same in form and material the moment after death as it was the moment before death, but nobody regards a corpse as a man. There are, it is true, a few materialists who believe that the body is all there is of a man, but the almost universal belief is that a man is an immortal soul which may dwell in a human body and may not, and a human soul no man has ever seen or cognized in any way whatever.

PERSONS ALL UNSEEN TO ONE ANOTHER.

When we say, in common parlance, that we have seen a certain man we mean that we have seen his body and witnessed in connection with it the phenomena of life. We have seen the glance of his eye, we have felt the warmth of his hand, we have heard the music of his voice and it may be we have seen an exhibition of his physical strength and his intellectual power and demonstrations of his emotions, but all this falls infinitely short of seeing, hearing or feeling the man himself.

The only reason we have to believe in the existence of the immaterial man is certain physical phenomena, and we have the same kind of reason to believe in the existence of the invisible God. For what the human body is to the human soul, for evidential purposes at least, the universe is to God, and this has given rise to the theory that God is the soul of the universe.

Here the parallel stops, though, as the demonstrations of power, of intelligence and of emotion are as much more extensive and more convincing in the universe as the universe is larger than the human body. The marks of design everywhere are so overpowering that scientists are actually unable to explain any part of nature without using the phrase "this is intended."

All this falls far short, to some minds at least, of proving the existence of either God or man, for the positive philosophy of Comte denies the existence of anything but phenomena, and the philosophical materialists hold that organized matter thinks and feels.

SCIENTIFIC EVIDENCES OF LIFE AFTER DEATH.

It is a most curious fact that modern science the world over has turned its tireless energies into every field of human interest except the one most momentous problem of all—life beyond the grave. In the last few years, however, a serious and well sustained effort has been made to investigate whatever evidence could be

gathered as tending to prove or disprove man's hope of immortality.

The psychological research societies of England and America have been the leaders in these investigations. With a membership of the foremost scientists, scholars, college professors and public men of the day, the committees of investigation and experiment have been peculiarly well equipped. The various phenomena of sleep, dreams, premonitions, visions, thought-transfer, apparitions, have been cautiously studied. The boastful claims of "materializing mediums," "spirit photographers" and fraudulent seance mediums have been patiently examined and the atmosphere cleared of much of the nonsense and trickery which have deluded the credulous.

A vast mass of experiences from all over the world has been collected, and phenomena everywhere have been patiently investigated by scientific specialists of the mind, so that no claims of happenings or belief have ever had such a thorough research into their realities.

To Professor Myers of Cambridge, England, was given the task of sifting all this tremendous array of evidence through which to reach a scientific conclusion.

After stripping bare the ingenious frauds which have deceived many, and analyzing one after another of the phenomena of the subconscious mind, which for a long time puzzled science. Professor Myers finds that he has left a mass of evidence which can be accounted for only on the theory that man lives a dual existence—one of the body and one of the soul or spirit. It is with that portion of the author's work which presents the evidences of spiritual existence after bodily death, of communications from the dead, that this page deals today.

He has written the following as his epitomized conclusion:

The question for man most momentous of all is whether or no he has a mortal soul; whether or no his personality involves any element which can survive bodily death. In this direction have always lain the greatest fears, the farthest-reaching hopes, and yet, man has never applied the method of science to the problem of survival beyond the grave.

The method of modern science consists in an interrogation of Nature entirely dispassionate, patient, systematic, and it is the application of careful scientific investigations of the many and varied phenomena of sleep, apparitions, premonitions, dreams, and many other puzzling human experiences which bring us to certain conclusions and results as to the proof of existence after death.

MYSTERIES OF PERSONALITY.

Whereas, till recently, the personality of man was regarded as something that was bounded by the limits of the normal consciousness, we now know "that, like an iceberg, which floats with most of its bulk submerged, the human mind, from its first day to its last, has more of itself below the level of consciousness than ever appears above it." We now are aware that personality is not "unitary." There is one part of it which is above the threshhold of ordinary consciousness and another part which is normally below it; and the first we may call the supraliminal, and the second the subliminal self.

THE SHOCK OF DEATH.

These various significant phenomena are being gradually brought into line with modern science, and they bring the strongest proof to show that the soul withstands the shock of death and that veridical messages may be given phantasmally to mortal man by spirits after bodily death.

The ancient hypothesis of an indwelling soul, possessing and using the body as a whole, yet bearing a real, though obscure relation to the various more or less apparently disparate conscious groupings manifested in connection with the organism and in connection with more or less localized groups of nerve matter, is a hypothesis not more perplexing, not more cumbrous, than any other hypothesis yet suggested. It is conceivably provable by direct observation. Certain manifestations of central individualities, associated now or formerly with certain definite organisms, have been observed in operation apart from those organisms, both while the organisms were still living and after they had decayed. Whether or no this thesis be as yet sufficiently proved, it is at least at variance with no scientific principle or established fact whatever; and it is of a nature which continued observation may conceivably establish to the satisfaction of all.

From the evidential scrutiny of modern facts we shall find that there are coincidences of dream with truth which neither purely chance nor any subconscious mentation of any ordinary kind will adequately explain. It is probable that the facts of the metetherial world are far more complex than the facts of the material world; that the ways in which spirits perceive and communicate, apart from fleshly organisms, are subtler and more varied than any perception of communication which we know.

The inference which all the mass of evidence suggests is that man is an organism informed or possessed by the soul. This view obviously involves the hypothesis that we are living a life in two worlds at once—a planetary life in this material world and also cosmic life in that spiritual or metetherial world which is the native environment of the soul.

DEATH COMPACTS.

Experiments with what may be called "death compacts"—the exchange of solemn promises between two friends to appear to each other if possible after death—have led to important results. There is real ground to believe that while such posthumous appearances may in most cases be impossible, yet that the previous tension of the will in that direction makes it more likely that the longed-for meeting shall be accomplished. This is a kind of experiment which all can make, and we have two or three authenticated cases where this compact has been made and where an apparition has followed.

In these self-projections we have the most extraordinary achievement of human will. What can lie further outside any known capacity than the power to cause the semblance of one's self to appear at a distance? Other achievements of man have their manifest element: where is the element here? The spirit has shown itself in part dissociated from the organism; to what point may this dissociation go? It has shown some in-

telligence, some permanence; to what degree of intelligence or independence, of permanence may it conceivably attain?

Of all vital phenomena, this is the most significant; this self-projection is the one definite act which seems as though a man might perform equally well before and after bodily death.

"THE NEW HELL."

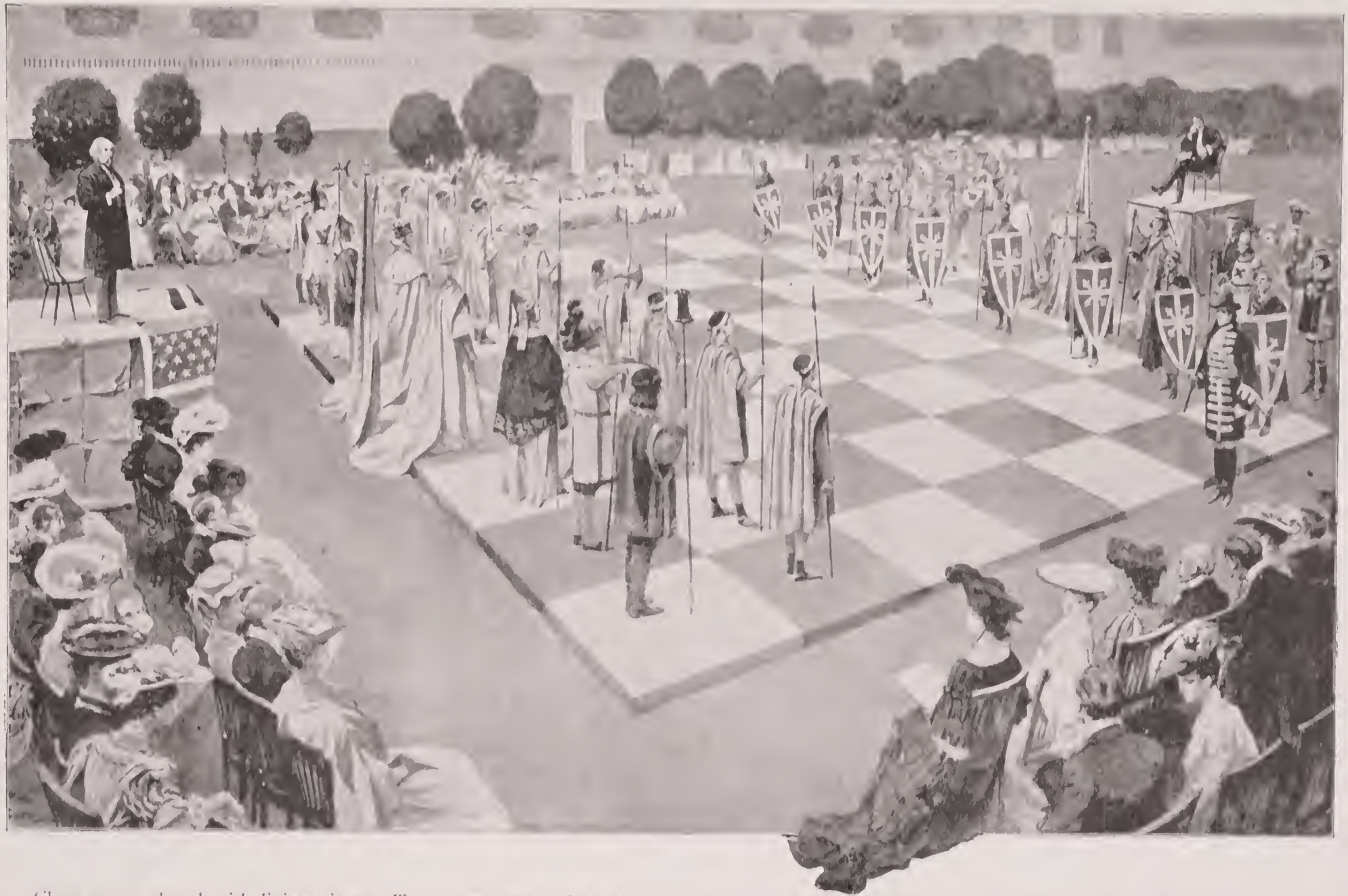
"St. John the revelator saw 'a new heaven and a new earth,' but it was reserved for the prophets of the present day to declare a new hell." Thus writes George T. Knight, professor of Christian theology in Tufts college. Professor Knight goes on to describe the change which has taken place in the popular conception of hell within recent years—a change which he ascribes to the growth of altruism or sympathy in human nature. Today the pulpit is not so ready to consign human beings to a place of torment, nor are congregations now so often harrowed by the old lurid pictures of that place. Professor Knight notes that today "practically no one questions that all children are saved" and that "this single change of doctrine has reduced by one-half the number of those consigned, by men, to perdition." He continues:

There seems to be among people in general, four states of mind with reference to this subject. The old doctrine of endless punishment still appears in some books; the doctrine of the annihilation of the wicked has also many advocates; a large number are quite noncommittal and do not know which way to turn; and, finally, there are many expressions of the larger hope. Among thoughtful Protestants in Germany, France, Great Britain and America, it is not clear which one of the four states of mind is most largely represented—though in America there is no doubt that endless punishment is commonly taught, or at least held. But the number of those who are to be subjected to its discipline is no longer the great majority of the race; it is rather "the proportion of those now held in prison," or even some smaller estimate.

PLEASANT PERDITION.

And after noting a certain danger that the tendency to changing conceptions of future punishment may go too far—"the 'new hell' is often made so pleasant that it is liable to be chosen by bad men as a place of residence"—Professor Knight concludes with this suggestion.

The thing to be desired as a remedy for the backboneless condition of some modern theology is not unlike the good old orthodox doctrine of fear and the sense of justice executed—less hell become like some of our "reform prisons," which, by unintelligent zeal in goodness, are made so comfortable and honorable as to fail of the purpose of prisons. Perhaps, indeed, there is evidence that the limits of excess are already reached. For a large number of the liberal orthodox, while their sympathies are fully alive, and they preach God's infinite tenderness in dealing with offenders, yet also as plainly and forcibly declare His equal and exact justice, the certainty of retribution in this world and in the next. Intelligence and conscience may be trusted to do the rest—that is, on the one hand, to clarify the doctrine with reference to mischievous asso-



Chess game played with living pieces. Two trumpeters attired as heralds announced each move as it was made. The pieces were attired in costumes of the fifteenth century. The pawns were costumed as esquires. At the end of the game the players who were beaten knelt in submission to the victors.

ciations, and on the other to fill out its meaning and give it definite expression, and thus to set forth a proper and efficient conception of divine government.

SEEING THE SHADOW OF A SOUL.

Professor Elmer Gates, a noted scientific psychologist, describes one of his experiments as follows:

"I have been experimenting with some light rays about five octaves above the violet—a form of wave energy akin to X rays, but about as different from them as they are different from sound. This new radiant force is invisible when produced in an ordinary room, but I succeeded in making it visible by projecting it upon a wall coated with a substance whose color is altered by the action of the rays in question.

MADE FROM EYES OF BEASTS.

"This substance was rhodopsin—the visual purple of the retina, the seeing substance of the eye which light acts upon. This rhodopsin I extracted from the eyes of freshly slaughtered animals. I find that all known inorganic and inanimate substances are transparent to this force. Unlike the X rays, they will shine through metals, bones, and such substances, which I can hold between the tube emitting these rays and the wall covered with rhodopsin without their casting a shadow, so to speak, or causing the color of the wall to be changed over the corresponding area.

"I find that any living thing, however, is opaque to these rays, and that it will cast a shadow as long as it retains life.

"A live rat is placed in a hermetically sealed glass tube held in the path of these rays and before the sensitized wall. As long as the rat remains alive it casts a shadow. On killing the animal it is found, after a certain lapse of time, that it becomes suddenly transparent.

"At the same instant a shadow having precisely the same shape as the animal is seen to pass out through the glass tube and move upward on the sensitized wall.

SAW THE SHADOW ASCENDING.

"Two of my laboratory assistants claim to have distinctly seen the shadow in the full course of its ascension. As soon as we can definitely prove this to other scientific men we will have demonstrated that some organism, presumably not atomic, perhaps etheric and capable of passing through glass, thus leaves the atomic body of an animal.

"Now, if in any way this escaping organism could be caught and made to give evidence that it still possessed mind, then we would for the first time have an inductive laboratory proof of the continuity of life after death."

"How do you now account for the opaqueness of the living organism under these rays, to which all lifeless matter is transparent?" the professor was asked.

ANIMALS DISCHARGE ELECTRIC WAVES.

"I can best answer that after describing another experiment," said he. "I arranged a room lined throughout with sheets of lead—walls, ceiling, and floor.

The lead was connected with the earth by electric conductors passing through a galvanometer sufficiently sensitive to measure the amount of electricity emitted by any person in the room.

"With this apparatus I demonstrated that the body has its every muscle and nerve electrically excited whenever exercised. Every muscle and nerve is an electric conductor. If I lift my arm, thus, and keep the muscles tense, they give off more electric energy than when kept at rest.

"During exercise of the mind there are similar electric discharges into the surrounding atmosphere. By quantitatively measuring the electric waves given off by a person in mental activity we can effect some measurement of that activity. By measuring the electric waves given off by them you can compare two emotions. If you have a more intense emotion of any kind than have I, of that same emotion you will give off more electric waves while exercising that emotion than will I. Thus, if I were to take two brothers separately into the lead-lined room, announce to each the news that his mother had died, the galvanometer would show in whom I had excited the strongest emotion of grief. This is the first time in the history of psychology that there has been any conceivable method of comparing subjective conscious states.

"But to return to the rat in the tube. My explanation of its opaqueness while alive is this: In any living body there are electric waves hurrying in all directions through the nerves and muscles. Light waves, which are electric waves, cannot penetrate such a bundle of electric impulses."

"Do you think, then, that the life fluid is an electric fluid, as many aver?"

"I think that life is some unknown resultant of a number of forces of which electricity is one. Life or mind is more intimately connected with matter through electric force than through any other."

"Do you hope to catch that organism which left the dying rat and cast its shadow on the wall?"

"I am unwilling to discuss in detail my experiments in these as yet unknown fields until after they shall have been further investigated by others.

"If such an experiment can ever be successfully made, then biology and psychology will have been extended across the border without an intervening chasm, and the continuity of personal identity beyond death will have been scientifically demonstrated."

"Would that be a scientific proof of the immortality of the soul?"

"No, it would not demonstrate endless existence—merely the continuity of life beyond what we call death.

"The visible animal organism is composed of atomic solids, liquids, and gases. May there not be etheric solids, liquids, and gases, whose particles are infinitesimally smaller than atoms, and might there not be an etheric body composed of them, might be asked. Such truth could be made a co-ordinate part of the growing body of scientific knowledge.

RAYS OF LIGHT FROM THE HUMAN BODY.

MARVELS OF THE "N" RAY.

The N-rays were discovered by M. Blondlot, professor of physics at the University of Nancy, who gave them their name simply because they were discovered at Nancy.

M. Auguste Charpentier, the colleague of M. Blondlot in the laboratory, perceived that every time he brought a phosphorescent body near to a human body in the dark the phosphorescence of the former was increased. This led to the discovery that the human body was constantly giving off N-rays.

M. Charpentier made use of a barium-platinum-cyanide screen, rendered slightly luminous with salts of radium, covered with black paper, and placed at a variable distance. He observed that the luminosity or phosphorescence was especially increased along the course of the nerves and in proximity to the muscles. The phenomenon was observed even when the screen was held at some distance from the body, and when substances were interposed, such as aluminum, dry paper, glass, etc., which are transparent to the N-rays. It ceased when substances which are opaque to the N-rays, such as lead, wet paper, etc., were interposed between the body and the screen.

M. Charpentier observed that the psychomotor areas of the cerebral cortex of the brain manifested themselves clearly by an emission of N-rays while they were in activity. One of them is called "the centre of Broca," which is the seat of articulated language. While the subject spoke the screen was moved over the side of the head, and the phosphorescence attained its maximum intensity exactly over the centre of Broca.

Every organ and part of the body, the brain, the heart, the nerves, the stomach, the lungs, have their characteristic radiations which show themselves on a fluorescent screen.

The course of a nerve, the activity of a brain centre, are clearly indicated by increased luminosity on the screen.

Professor Blondlot of the great French University of Nancy, was the first discoverer of these rays. He found them in various inanimate substances and then his colleague, Professor Charpentier, of the same university, observed their presence in the human body.

CHARACTERISTICS OF "N" RAYS.

The chief characteristic of the N-rays is that they excite an increased phosphorescence or luminosity in a body that is already slightly phosphorescent.

Professor Charpentier made use of a barium-platinum-cyanide screen such as has been used in X-ray and radium experiments. This was rendered slightly phosphorescent by means of a certain quantity of radium.

While moving this screen over the surface of the human body Professor Charpentier observed that the phosphorescence increased greatly over the nerves and the muscles. The light produced by the muscles was stronger when they were contracted. He found that he could follow the course of a superficial nerve and its various branches with great exactitude by the increased phosphorescence.

This phenomenon is produced at a very considerable distance from the body, and also when substances such as aluminum, wood, dry paper, glass, etc., are interposed between the skin and the screen. It was at first suggested that the effect might be produced by the increased temperature in the vicinity of the body. But when several sheets of aluminum and of cardboard, forming successive layers of air and completely cutting off any heat from the body, were interposed, the rays acted just as strongly as ever.

THEORIES OF THE "N" RAY.

Another hypothesis was that the body might be merely giving out phosphorescence acquired by exposure to the sun. It is well known that many substances gather up phosphorescence from the sun and then become visible in the darkness. This is exhausted after the substance is kept away from the sun for a certain length of time. Professor Charpentier remained in the dark for nine hours and found that the radiations of the human body had not lost any of their strength whatever. He concluded that the body is not an accumulator, but a producer of N-rays.

Doctors have found already that they can auscultate the heart by observing the N-rays at least as effectively as with the usual apparatus, which depends upon the sound produced. This is one of the earliest practical uses of the discovery, but it indicates in an extremely small degree the great uses which medical science expects to make of the N-rays.

The activity of the tissues is indicated by the rays, and each patient will be represented by a number indicating his normal luminosity or N-ray activity. The doctor having this will always possess an exact guide to the state of the patient's health.

Prof. Charpentier has made some extremely interesting experiments upon the N-ray activity of the brain centres. He has found that the psychomotor areas of the brain which direct all our movements manifest themselves very clearly by giving out N-rays while they are in operation. One of the most important brain centres is that called Broca's centre, which is the seat of articulated speech. Prof. Charpentier told his patient to speak freely. He found on observing her skull with the fluoroscope that the phosphorescence reached its maximum intensity exactly over Broca's centre. This centre, by the way, is situated on the left side of the brain, and no increased luminosity in the fluoroscope could be observed at the corresponding spot on the right side.

EXPERIMENTS WITH THE "N" RAY.

Prof. Charpentier carried this intensely interesting experiment further. He planned to give his young woman subject a sudden fright. While she was sitting in his laboratory awaiting with indifference the next experiment his assistant suddenly unveiled a grinning skeleton, borrowed from the hospital, before her eyes. Keeping his eye glued to his fluoroscope he at once observed a very sudden and violent outbreak of luminosity in a certain area of the brain. This was clearly the fear centre.

He was afterward able to locate by more or less similar methods the centres controlling love, joy, anger, and practically all the emotions and intellectual

faculties. He is constantly pursuing this line of investigation and will very shortly make known further important observations.

He finds that concentrated mental effort gives rise to a strong and peculiar form of radiation, which produces a very marked increase in the luminosity of the fluoroscope. This is general over the greater part of the brain. Needless to say, this is an observation of the greatest importance to psychology.

The professor has found centres that correspond with the faculty of writing and those that direct the movement of the various limbs. Every nervous centre gives forth the N-ray in proportion to its degree of activity. Nervous activity transforms itself partly into radiation, which can be exactly measured by the degree of phosphorescence they excite on the luminous screen.

SPECIAL PECULIARITIES.

Every solid subjected to pressure gives out the N-rays. Professor Charpentier compressed the nerves and found that their luminosity became immediately much greater. If the compression is prolonged the radiation will finally grow less.

The course of the spinal marrow could be traced distinctly by the increase of luminosity, which became much greater as the professor approached the base of the brain. The luminosity was considerably increased when the backbone was rubbed vigorously. The contraction of an arm produced increased radiation from the backbone near the brain.

The professor explains that the radiations from the human body are far from being composed exclusively of N-rays. The radiations are of several kinds and very complicated, and they have not all been properly defined. The N-rays seem always to constitute the majority, but the other kinds are very noticeable in the radiations given out by the nerves. This is proved by the fact that while the N-rays proper pass through aluminum with great ease, a considerable proportion of the rays from the nerves are stopped by the thinnest possible sheet of aluminum—nineteen-thousandths of an inch thick. Those rays which did pass through the aluminum were not impeded in any way when a sheet of the metal several inches in thickness was interposed.

SPECIAL RADIATIONS OF MUSCLES.

On the other hand, the heart and the larger muscles appear to give out the N-rays almost exclusively. It is therefore very easy to distinguish between muscular rays and nervous rays. The nerve increases its radiation when it is compressed, but a similar compression of a muscle has much less effect. Another peculiarity is that the nervous rays produce a much greater luminosity than the muscular rays when the screen is heated to 113 degrees Fahrenheit.

Some of the obscure human rays penetrate both lead and water, which are peculiarly opaque to the N-rays proper. Others not only pass through the air in a straight line, but are conducted by a metal wire. Professor Charpentier affixed a metal wire about ten feet in length to a small plate of copper an inch and a half in diameter. He connected the other end of the wire with a phosphorescent tube. Then he brought the plate in contact with the human brain, and the phosphorescence at the other end of the wire

immediately increased. With this apparatus the doctor can observe the operation of the rays while remaining at a distance from his patient, and thus avoid the possibility of influencing him.

All animals emit N-rays. The professor has traced the nervous system of a frog thoroughly by means of them, and as this animal had a very low temperature with regard to that of the laboratory this experiment furnished another proof that heat had nothing to do with the phenomenon.

Phosphorescent microbes and glow-worms, strange to say, behave in much the same manner as the phosphorescent screen. When they were placed in the vicinity of the human heart their luminosity as observed in the darkness increased remarkably. All living matter, it appears, produces N-rays as well as much inorganic matter. Fermentation is always accompanied by radiation. Vegetable life has its peculiar rays. Sound and music produce N-rays in abundance.

WORK OF ANOTHER SCIENTIST.

Curious to say, another scientist, Dr. Baraduc, of Paris, has also observed these emanations of the human body, but without studying them by the same methods applied to radium rays and the X-rays, and without recognizing clearly that they are radiations allied to these. Nevertheless, he has devised a very interesting instrument for observing them.

It consists of two glass jars, in each of which a magnet is suspended. Under the magnet, in each jar, there is a cosmogonic chart invented by the doctor. It describes, in the circle of 360 degrees and numerous subdivisions, parallels and squares, the amount and direction of vital forces as studied and compared by him with infinite patience and countless experiments. The movements of the magnetic needles when in your proximity indicate certain figures on the chart, which the doctor notes, and which you can afterward compare yourself, according to set formulas which he has established.

In order to make an experiment, he simply sets the two jars before you, separated about three inches from each other. You place your right hand within an inch or two of the right-hand jar, and the left hand similarly within an inch or two of the left-hand jar. Within a minute or two you see the needles begin to move. They continue to move for a while, and after three or four minutes come to rest at a fixed point. They may have advanced and gone back—in other words, oscillated between certain points, or moved directly to the point they hold. All this is noted by the doctor and he proceeds to give you the explanation.

The human body, he says, is surrounded not only by a magnetic fluid, but also by a vital fluid. The vital fluid acts upon the needle through the magnetic fluid, and gives you exactly the amount and the various kinds and degrees of vital energies that you possess. The right side, you will find, represents what he calls the physical energies, the left side the mental energies. The two forces also correspond to the positive and negative poles of the magnet.

SEEING THE MIND THROUGH THE "N" RAY.

To look through the skull of a man and see the workings of his mind is an achievement hitherto undreamed of. Yet that is exactly what Prof. Blondlot of

Paris has succeeded in doing by the aid of the newly discovered N-rays.

It is a matter perfectly simple, the instrument employed being nothing more complicated than a small rectangular piece of pasteboard (the size of a playing card), one end of which is spread with a paste of phosphorescent sulphate of calcium. This substance, it appears, is made luminous by rays of the "N" description.

When such a card in a darkened room is applied to a man's head it does some very remarkable things. The person under experiment is told to talk, and he keeps on talking, while the bit of pasteboard is brought into contact with various parts of his cranium. It shows no change until a certain area on the side of the head is reached, when suddenly the luminosity of the paste becomes greatly increased. And why? Simply because this is the area of brain surface which controls vocal speech. In working it gives off (in a way presently to be explained) a flood of N-rays, which cause the sulphate of calcium to shine.

But this is not all. Prof. Blondlot has found that by passing the card slowly over the head and watching the variation of the shine he can outline with perfect accuracy the vocal speech area of the brain surface. Of course, the man must talk all the time, so as to keep the speech centre working, else the card would cease to give indications.

As everybody knows, it is the gray stuff, forming the surface layer of the brain, that does the thinking and controls the physical activities. Apparently this layer is divided up into patches, each of which has its separate function for speaking, seeing, hearing, smelling, tasting, and directing the movements of the various muscles of the body. Chiefly by vivisection experiments on monkeys and dogs these patches on the human "cerebrum" have been approximately located, but by the use of the sulphate of calcium card they can now be definitely outlined.

Thus, by the help of an entirely new means, the living human brain is to be accurately mapped. For the card can be used as satisfactorily for outlining other cerebral areas as for determining the location and limits of the speech centre. All that is necessary is that the person under experiment should listen intently to music, say, and the phosphorescent stuff will shine brightly when brought close to the part of his skull beneath which lies the centre of hearing. It is the same way with the other sense centres, activity of any one of which causes an outflow of N-rays.

AUREOLES AND HALOS.

When, about a century ago, Reichenbach, a scientist of high reputation, claimed that he could sometimes see a sort of aureole, or halo, about the heads of people in the dark, it was supposed that he was the victim of an hallucination, but it is at least conceivable that the phenomenon was due to an emanation of N-rays, which may, under certain circumstances, become visible to the eye.

Another theory that has been suggested is that possibly the N-rays may be accountable for the phenomena of telepathy or thought transference, by which ideas are conveyed from one person to another, even at a distance, without speech, writing, or the use of any ordinary means of communication. That

such messages sometimes pass from mind to mind is a fact proved beyond question, though nobody as yet has been able to ascertain the agency by which the mental telegraphy is accomplished.

All of the nerve centres of the human body, when in a condition of activity, emit N-rays. When the brain, which is the greatest of nerve centres, is working, its activity can be made to show itself by the use of a card, such as the one already described. It is placed in contact with the forehead, and the person under experiment is asked to think hard and to stop thinking at intervals, without telling which he is doing. The card shows every time by its brightening—of course, the trial is made in a darkened room—when the mind is busy; when it is idle, the sulphate of calcium becomes dim.

STRANGE RADIATIONS OF BODIES.

Not only the nerves, but the muscles of the body, give off N-rays when under tension. Apparently, the human body stores these rays, and it is the same way with the lower animals, such as dogs, rabbits and frogs. Inanimate substances of certain kinds, such as glass and quartz, exhibit the same phenomenon, but wood, paper and aluminum do not possess the property. One great source of the rays is the sun, and some of the objects on which they fall become saturated with them. When any one of these objects is subjected to strain, it emits the rays.

Thus, when a piece of glass or iron is bent or subjected to pressure it gives out N-rays. Tempered steel, owing to the arrangement of the particles composing it, is at all times in a state of strain, and on that account is continually giving off the rays. Nor does the period during which it may do this appear to have any limit, a sword blade of the time of Charlemagne being found by Prof. Blondlot to exhibit the phenomenon. Silver, lead and glass are first-rate storage receptacles, so to speak, for N-rays. They will not pass through pure water, which is so opaque to them that a cigarette paper moistened with fresh water will stop them. On the other hand, salt water is perfectly transparent to them, and so likewise are wood and quartz, as well as rock salt.

The rays have no effect on the photographic plate. They are not visible to the eye, unless under conditions not yet ascertained. In other words, they produce no sensation of light. Nevertheless, when they are thrown upon your eye, in a half-darkened room, objects in view become more clearly visible. They appear also in some mysterious way to increase the acuteness of the senses of taste, smell and hearing.

When, in a half-darkened room, the blade of a knife is placed near the eye of the observer, the N-rays emitted by it enable him to see objects more clearly. If it be applied to the side of the head, the distinctness of objects seen is augmented. These are only one or two of Prof. Blondlot's recent experiments which, when carried further, may be expected to yield some astonishing results. He has found that the rays can be transmitted by a copper wire, which makes a first-rate conductor for them. Thus, if they have any relation to telepathy, the time may yet arrive when thoughts can be telegraphed.

The N-rays are a part of the invisible

sunshine. They belong among the rays in the extreme "ultra-violet," far beyond the upper end of the visible solar spectrum. By means of his wonderful instrument called the "bolometer," Prof. S. P. Langley has succeeded in making a photographic chart of the region of invisible light beyond the violet, and has pursued his exploration in this direction so far that the path he has covered represents a distance of thirty feet on a scale in which the visible spectrum of colors, as thrown by a big prism, is only three feet long. The prism is of rock salt, mathematically cut, this material being transparent to the ultra-violet rays, whereas the clearest glass is opaque to them. In the region of unknown colors thus explored lie the wonderful N-rays. Prof. Langley has turned his "bolometer" upon them, and it may be that before long something much more definite than is now known may come to be understood about them and concerning curious phenomena for which they are accountable.

THOUGHT RAYS DISCOVERED.

After X rays, N rays; after N rays, I rays. I rays proceed from the brain. They are thought rays. They were discovered by M. di Brazza, student at Liege, when repeating the N ray experiments of Professor Charpentier. Charpentier found that the phosphorescence of certain substances is increased when they are brought close to a nerve or to a contracting muscle. When some one talks variations are produced in the luminosity of calcium phosphate. In another experiment Charpentier saw the phosphorescent substance shine all down the line of its application to the spinal cord. Charpentier concluded that the emission of rays goes *pari passu* with activity of function, which puts us in possession of a new method of studying nerves and muscles. Di Brazza now claims to demonstrate what Charpentier surmised—to-wit: that the "brain is the seat of active radiation." The I rays differ from the N rays in that they can pass through moist substances and are not bent nor refracted. Di Brazza observes them directly and indirectly. In direct observation he applies a phosphorescing screen treated with platinocyanide of ba or other phosphorescent substances to the patient's head. The screen is faintly illuminated by a radiographic tube inclosed in a wooden box. When the subject concentrates his will, curious oscillations appear in the luminosity of the screen in relation with the patient's psychical activity. When his attention is not concentrated the light does not flicker. The rays are not emitted equally from all parts of the head. They are nill at the forehead, increase at the temple and eyes, and are at their maximum behind the ears. The I rays are named for Italy.

CRYSTAL GAZING.

A PSYCHOLOGICAL RIDDLE.

When seventy years ago the oriental scholar, Edward William Lane, published his "Manners and Customs of the Modern Egyptians" surprise was caused by his account of a seance during which a Mughrebee magician summed visions in a crystal of people whom the writer recognized from description. His curiosity regarding this subject had first been

Tramway cars and wheelbarrows loaded with eggs at the rookery of sea gulls in the Hawaiian Islands. From these eggs albumen is manufactured. It is used in fixing the colors in calico printing, clarifying ropy sirups, and in photography.

roused by hearing from the British consul general that a servant who defrauded him, and of whom no suspicion had been entertained, was described from a vision seen in the crystal, and on being charged with the theft had confessed his crime.

Possibly Mr. Lane was unaware that the same means of detection was common in England until "the wisest fool in Christendom," James I, passed laws making crystal gazing a serious and punishable offense. At all events, the English traveler desired to see for himself the reputed marvels of the magician. The latter, a green turbaned follower of the prophet, being sought and found, agreed to exhibit wonders which were due, said he, to the agency of good spirits. Though he could summon visions, they could be seen only by a young boy, whom Mr. Lane was allowed to select, and who was summoned by him from a group of lads playing in the street outside.

The crystal in this case was represented by some ink placed in the boy's right hand and in the centre of a magic square that had been traced there. Incantations were then chanted, frankincense and coriander seed were flung upon burning charcoal, when the lad, with every appearance of fright, began to describe the figures he saw reflected in the ink. It must be borne in mind that their entrances and exits were made at the command of the magician. When he bade the lad to summon the sultan, that august person appeared riding on a horse, surrounded by soldiers, etc.

HISTORICAL INCIDENT.

When many scenes had come and gone, Lane was asked if there was any person living or dead whom he wished the boy to see. He named Lord Nelson. The description of what followed is best given in his own words: "The boy then said a messenger is gone, and has returned and brought 'a man dressed in a black suit of European clothes; the man has lost his left arm.' He then paused for a moment or two, and, looking more intently into the ink, said, 'No, he has not lost his left arm, but it is placed to his breast.' This correction made his description more striking than it had been without it, since Lord Nelson generally had his empty sleeve attached to the breast of his coat; but it was the right arm he had lost. Without saying that I suspected the boy had made a mistake, I asked the magician whether the objects appeared in the ink as if actually before the eyes, or as if in a glass, which makes the right appear left. He answered that they appeared as in a mirror. This rendered the boy's description faultless." Mr. Lane declared himself puzzled by this seance, especially when a present was refused that he offered to the boy on the condition that he confess to imposture. Out of deference to the skepticism of the English public of that day he ends his account by hoping the reader will not allow it to prejudice his mind with respect to other portions of the book.

MODERN VIEWS OF BLACK MAGIC.

Nowadays, when after thousands of years man is beginning to gain some glimpse into his own nature, it would be as reasonable to credit this vision to magic as to believe that thunder was the threatening voices of wrathful gods. All phe-

nomena are due to laws of nature, though many of the laws are not yet understood. The visions described by Mr. Lane are explainable on the ground of hypnotism and telepathy. Any mesmerist or hypotist is able to make a subject see, hear, taste, or feel in obedience to suggestions. It is unnecessary that a subject should be asleep or unconscious in order to secure his obedience. Slight states of hypnosis are readily induced in many persons either by themselves or others without their knowledge, but are quite sufficient for purposes of suggestion.

Inducements to hypnosis, which are used in all forms of so-called magical rites, are the monotonous repetition of chanted verses, the burning of incense, and the continuous stare at any object. These induced the hypnotic state in the boy, who saw what the magician desired him to see; just as the subjects of any hypnotic entertainer see or hear whatever he suggests. It was probable that neither the magician nor the boy had ever seen Nelson or his portrait; from which it may be argued that it would be impossible for the former to make the latter see a figure of which he had no conception. But the image of Nelson was in Mr. Lane's mind, which communicated itself to that of the boy, which in turn flung its reflection into the shining surface of the ink, or visualized it, as it is called.

That such mental communication is possible without conscious effort of the mind, or without physical touch, can be proved by any one, if personal experience has not made the trial unnecessary, or if not convinced by the evidence in favor of it, largely due to the labors of Sir Oliver Lodge, and published in the proceedings of the Society for Psychical Research in London. It is now within the power of this factor of the human mind to explain many of the occurrences that for centuries have puzzled the skeptical, and been set down by the mass to the supernatural.

SCIENTIFIC ANALYSIS OF MENTAL PHENOMENA.

Possibly the most logical, clear, and concise analyses of telepathy will be found in Dr. Hudson's "Law of Psychic Phenomena." Briefly speaking, his theory, now widely accepted by the scientific world, is that the human mind is dual in its nature: the upper, or objective mind being the means by which we reason and conduct the business of life; while the lower, or subjective mind, is the storehouse of memory, where every circumstance of life from the dawn of reason is carefully chronicled and remembered, though forgotten by the objective mind. The subjective mind of one individual is capable of sending messages to the subjective mind of another without the objective mind of either being aware of the fact. Such messages are called intuitions.

It is also possible for the subjective mind of one person to be read and interpreted by another subjective mind when a state of passivity or hypnosis is induced in the objective mind of one or other, or of both. This state is induced consciously or unconsciously by all readers of fate and fortune, while they remain perfectly quiet and stare at a pack of cards spread out on a table, at a crystal, or the leaves in a teacup. At such times they are, as is within the experience of most people, able to read the events of the past, give names

and descriptions of the living or the dead, all of which are found in the subjective minds of those who consult them.

It is this subjective mind that finds the hidden pin, reads the number of the enveloped bank note, writes messages through the planchette, or, by automatic writing, gives the description of the writers of letters, or the surroundings of some object handed to the psychometrist, all information given being known and read from the mind of some one present, when the power is exhibited. It is also the subjective mind that, drawing from the rich stores of its memories, delineates the characters and develops the plots of novelists, many of whom state that when writing words seem dictated to them, or that their puppets work out their destiny irrespective of control; while painters sometimes confess to working under an influence outside themselves. The influence is inside themselves in the subjective mind, which is enabled to give out of the fullness of its treasures, while the objective mind is made passive by staring at paper or canvas. It is also the subjective mind that flashes the whole panorama of his life upon the dying man.

ARE WE POSSESSED OF MORE THAN ONE SOUL?

ONE OF MANY MARVELOUS CASES ON RECORD.

The "Strange Case of Dr. Jekyll and Mr. Hyde" was no mystery at all compared with the case of a young girl in England, who is said to possess at least a dozen different souls.

When this young girl was twelve years old she was attacked by influenza and some form of brain disease. Since that time (she is now eighteen) she has completely changed her personality again and again.

No doctor can explain the mystery. The girl will suddenly begin to jerk her arms and shake violently. Then, with a quick start, she will look up and become an entirely different person. Some of her different personalities have been as follows:

(1) A modest, well-behaved, ordinary girl.

(2) A noisy, bold child, talking in broken language, like a three-year-old child.

(3) A very bad-tempered but clever girl, able to read and write.

(4) A deaf and dumb girl.

(5) A clever and sweet-tempered girl, who was very fond of learning to speak French.

(6) An insane, blind girl, who had great skill in drawing.

(7) A violent and cruel girl, who delighted in causing pain to her younger sister.

(8) A self-willed but not cruel girl, who was very disobedient and reckless.

Sometimes one of these "souls" would rule the girl for months, and sometimes only for a week or so. The deaf-mute "soul" ruled her five different times.

Each "soul" has no memory of what the other "souls" have said and done. Nothing that the doctors can do can prevent these extraordinary changes of self in the young girl. Even the London Lancet, the most conservative of English medical journals, has called attention to her case.

Can it be true, as these facts seem to indicate, that one individual can have more than a dozen souls?

A problem like this shows how much we have yet to learn in some branches of knowledge. Psychology, which should be able to explain it, is dumb when confronted with such cases. The wise and the thoughtless alike can do no more than speculate and imagine.

We know that a child may take the nature of its great-great-grandfather or some other of its ancestors. May it not be possible for a child to take the nature of a number of these ancestors?

Perhaps a human mind may have dozens or hundreds of facets, like a diamond or the eye of a fly. Every facet may mean a new personality.

Perhaps there may be some means, unknown to us, of cutting a mind free from that chain of habit which we call character or personality and binding it at once with new chains.

This case is so unusual that we are compelled to end with a perhaps. We can only regard it with the same ignorant amazement that a Hottentot feels when he sees an automobile.

It convinces us that, although the mysteries of the universe are many, man has never yet found a greater mystery than himself.

OUR DUAL PERSONALITY.

Experiments by a large number of specialists in mental and nervous diseases have settled beyond any doubt the existence of a mental condition called the dual personality in man.

Though this condition is sickly, the foundation for it is nevertheless present in every human being.

All our actions may, as everybody can prove by personal observation, be classified in two groups—those which are controlled by the will and those which are not.

We are, at the same time, thinking and willing beings, and automatons.

When a man walks along the street reading a newspaper he will walk in a certain direction, evade collisions with other people and wagons, perhaps open or close his umbrella or button his coat without thinking of these actions, which are performed absolutely automatically while his mind is busy with other things.

People who are very familiar with music may continue humming or whistling a tune which they have once begun, while their thoughts are far away, and only become conscious of the fact when they have finished the tune.

This automatic being in us, who performs all sorts of actions without thinking and without being controlled by the brain, may, under certain sickly conditions of the brain, become absolutely independent of the latter.

Hysterics, epilepsy, somnambulism are conditions of this kind which may effect a separation of the dual personality, and in aggravated cases entirely suppress the conscious personality and become his dominating part.

The parable of the upper and lower storey used by Frederic Theodor Vischer to illustrate another side of our mental life applies very well to this.

A PECULIAR CASE.

A prominent physician tells of one of his patients who always lost his way in the streets if he tried to think of the right way to go, but who always found his way home automatically if his mind was occupied with other things.

Certain disturbances of speech which manifest themselves in reiteration of certain words and sentences belong in the same class.

The separation of the dual personality may also be caused by lesions of the brain caused by a fall or a blow on the head.

The actions caused by hypnotic suggestions are especially interesting, because the will power of one person takes absolute control of all the actions of another who becomes absolutely powerless and may remain so even a long time after the end of the hypnotic condition. This, of course, is an abnormal and sickly condition, but there are transitory stages leading up to it which may be observed in everyday life and which are absolutely normal.

HYPNOTIC POWER.

All persuasion, all advice followed, are really nothing but mental suggestions and victories over the will of another person.

Every hypnotist must also continually strive to gradually gain influence over the persons whom he wants to treat.

If you let a person close his eyes and say to him: "I command you to be unable to open your eyes, and you will not be able to do so," you will almost invariably find the experiment a failure.

The step is too sudden and abrupt, and the person experimented with will, in the deciding moment, reason with himself, "Why should I not be able to do it?" and it would not be possible to conquer this resistance of his will.

An experienced hypnotist will then ask the person if he did not find it more difficult than usual to open his eyes, and if this is conceded he will build further on this admission until he finally arrives at a point where he has the other person completely in his power.

The fact that the greater number of nervous people are easily influenced by others of stronger will power has made it possible to cure many of them entirely by suggestion, though there is no doubt that their will power is weakened thereby and the separation of the dual personality liable to take place with alarming frequency and ease.

Psychologists and physicians are still battling with the problem of these two souls in man and gaining wonderful insight into the deepest recesses of our mental activity, but as yet, though we can no longer deny the presence in ourselves of these two souls, their relations are not entirely clear.

LOST IDENTITY.

THE STRANGE PSYCHICAL MALADY OF MODERN LIFE.— MARVELOUS EXAMPLES.

"What are the causes of apparently healthy persons suddenly losing their identity?" was a question which a celebrated English brain specialist dealt with recently in the hope that the results of his researches and his advice might prove of benefit to the public.

The physician recalled some remarkable cases of what are known as "psychical

changes" which have recently come to his notice, including the experience of a gentleman who a few days ago entered the Record office in Chancery lane and announced to an astonished official that "he did not know who he was, as he had lost his memory."

Another case was that of a young lady who wandered from her home at Clacton to Finsbury, a distance of thirty miles, and furnished to the police at the latter place a name which she "thought" to be her father's. A telegram, however, sent to that address was returned "unknown."

A third illustration of these curious psychological phenomena was that of a clergyman who, after withdrawing from his bank a substantial sum of money with which to complete the purchase of a piece of land, entered a tramway car. From that moment his mind became a blank, and he wandered 500 miles to a large town, where with the money he bought a stationer's shop and erected a sign bearing the name of "Brown."

After six weeks a customer entered, and, addressing the man behind the counter as Brown, proceeded to purchase some small articles of stationery. The proprietor replied that his name was not Brown, but Bourne, and that he knew nothing about the business.

"The man had suddenly awakened from his prolonged lapse of memory," added the physician.

No less remarkable was the case of a London man who traveled to Leeds to fill a situation which he had been very anxious to obtain. He had a brief and satisfactory interview with his employer, and then went to look for lodgings. The next thing the man remembered was being in a train at Grantham on his way back to London.

The strange feature of this case was that the unconscious man had carefully and accurately relabeled his luggage for the address he had previously occupied in London.

"As a matter of fact," explained the physician, "these persons behave in quite a rational way, although they are really unconscious all the time. They spend money carefully, and eat and sleep with their customary regularity. They are but partly mentally deficient.

"The brain is commonly regarded as a single organ. It is in reality a collection of parts, different and distinct, but closely related to one another, and connected with every portion of the body by nerves. In non-technical phraseology, certain of these cerebral subdivisions become impaired where cases of 'lost identity' occur.

SPECIAL CASES OF PARTIAL INSANITY.

"In cases where the sight of a printed word fails to revive memory, the disease is known as 'word blindness,' and instances when a word spoken is not appreciated, but the same word written stimulates the memory, are known as 'word deafness.' The latter patients are unable to utter a sound, and yet can write very intelligent letters. The auditory word-centre of the brain refuses to act.

"Again, there are cases where people are not capable of either speaking or writing the words which they nevertheless remember. Hence the large number of lost persons who cannot furnish the authorities with their own names.

"Very common are the cases where

persons forget events that have just occurred and yet retain excellent impressions of things that happened years ago and impart knowledge which was acquired in their childhood and had long been forgotten. One man who was professionally treated could not remember his own name, but could recite whole chapters of the Bible.

"The development of many of these cases could be checked," proceeded the doctor, "if their friends sought timely advice. 'Memory' is regulated by the amount of attention which a person is able at the time to give to the subject to be remembered. This power of attention is greatly diminished by disease. An ill-nourished body implies an ill-nourished brain. Malnutrition is a frequent cause of brain failure and consequent 'loss of identity.'

"Various fevers, influenza, and all kinds of mental shock and blows upon the head may have these unfortunate results. Overwork, especially when accompanied by business worries or domestic anxiety, is a factor to be reckoned with. But, above all, the persons most liable to sudden 'loss of identity' are those of an epileptic tendency, although it is difficult to reconcile a protracted lapse of memory with this cause."

No fewer than 34,000 persons are "lost" in London every year, and Scotland Yard has been called upon to deal with as many as 2,000 such cases in the course of a week.

TRAVELING IN TRANCES.

WHEN PEOPLE HAVE SUFFERED FROM LOSS OF MEMORY.

On April 27, 1903, an Antwerp policeman was startled out of his usual self-possession by a man who approached him and asked in good Dutch, "What town is this?"

The officer at first thought that he was being made a fool of, but it very soon became clear that his interrogator was quite in earnest. The man had a dazed appearance, and though well dressed seemed unset and unhappy.

The policeman, concluding that the man was a lunatic, got him to accompany him to a hospital where the doctor, however, pronounced him perfectly sane.

The wanderer's name was John Donhauser, and his story was that he was a native of Antwerp, but had emigrated twenty years before to America, where he had made his home in Milwaukee.

On March 15th he had left Milwaukee for Chicago. After that he remembered nothing more until he found himself walking in the street where he had met the policeman.

Inquiries proved his account to be perfectly true, and the only explanation was that he had fallen into a sort of walking trance. He was assisted to a homeward-bound steamer and left immediately for New York.

THE LOST LADY OF THREADNEEDLE STREET.

But his troubles were not over yet. On the way across the Atlantic he fell into a second trance, and when he arrived at his destination he woke again to find that he

had been in the Government Hospital for three weeks.

Such cases of brain lapse are not so rare as may be imagined, though they have never been satisfactorily explained. The famous case of the "lost lady of Threadneedle Street," is, perhaps, the best known of recent events of this description.

One morning a few years back, just before noon, the police found a little old lady wandering aimlessly about Threadneedle Street in the city of London. She was dressed in a gray dress, a gaudily trimmed green straw hat, a startling green ribbon round her waist, and was followed by a crowd of loiterers.

When taken to the police station there was found upon her $35,000 in bank notes, and magnificent jewelry, valued at $10,000 more. She had lost her memory completely, and it was not for some days that her identity was discovered through her sister.

MEMORY GOES WHILE CYCLING.

Another very peculiar case of the same sort which also happened about two years ago was that of Miss Maud Pryce, the sixteen-year-old daughter of a New Cross painter. She started out one Wednesday morning in her usual health for a cycle ride, but in the evening did not return home.

It was not until the next day that her parents heard that she had been found wheeling through Tunbridge Wells. She had forgotten who she was, where she lived, and in fact every incident of her past life.

Taken home again she was unable to recognize her relatives, yet was able to recall distinctly everything that had happened since the morning of Thursday. She had not forgotten how to read, for she was much amused by the accounts given of her experience in the newspapers.

She had ridden thirty-two miles on the day of her cycling trip, yet as to the incidents of the day she could only remember two things, one asking a man in a passing trap to tell her the time, the other inquiring later in the day where the road she was on led to.

MIND A BLANK FOR SEVENTEEN YEARS.

Such lapses of memory have sometimes very serious consequences. A sergeant of the Royal Medical Corps was recently court-martialed at Dover on a charge of absenting himself without leave for a period of three weeks.

In the evidence it came out that during the whole of this time the unfortunate man had absolutely no recollection of what he had been doing, or where he had spent his time, until at last he found himself in his brother's house at London. It was said that he had suffered severely from fever on the West Coast of Africa and been invalided home.

Three weeks is, however, a trifling period of forgetfulness, compared with the seventeen years' lapse of memory of Francis Washburn, a painter, of 50 Charles street, Allegheny, Pennsylvania. In many respects this is the most peculiar case of its kind ever investigated by mental specialists.

Born in 1860 on a farm, young Washburn lived a quiet country life until he was twenty-four.

In the year 1884 he was traveling by rail to Denver, when the train went off the line, and Washburn was thrown some distance on his head. When he awoke in hospital all memory of his past life had absolutely vanished. Papers in his pocket, however, gave his name and address, and he went home.

By the time he was well again his family had become familiar to him, and neither he nor they realized that there was anything special the matter with him.

For five years he worked up and down the country he was born in, and then twelve years ago went to his present home and took up business as a painter and paperhanger. He married and had four children. His wife declares there never was a better husband and father.

When his eldest girl was nine, one night she dropped a lamp chimney. It fell with a crash at her father's feet, giving him a severe shock. He fell to the floor unconscious.

Next morning Washburn awoke to find a doctor and his wife bending over him. His first words were: "What hospital am I in? Were many hurt?" He imagined that he was just recovering consciousness after the train accident of seventeen years before.

The whole of the past seventeen years had slipped away from his mind and memory, and he then had to begin life mentally all over again from the age of twenty-four.

ANNUAL LAPSES OF MEMORY.

The causes of these peculiar trances are sometimes very curious. Jules Roux, a sixteen-year-old French boy, was found one day last April wandering about Paris in a half-starved condition. He was quite unable to give any account of himself or say where he had come from.

A week later he recovered his memory and told the hospital authorities that his home was near Rouen. Three years before he had been bitten by a dog and was terribly frightened and injured.

Each Spring since at the same date he has for a time lost his memory. But how he reached Paris, whether on foot or by rail, he has not the faintest idea.

Another strange peculiarity about some people in such a peculiar mental state is their ability to bear pain. There recently arrived at the town of Starsbielstey, in the Province of Khaikoff, in Russia, a peasant named Plotnikoff, whose hand had been cut off with a chopper.

The man had gone into a fit of religious frenzy in which he had literally obeyed the Biblical instruction, "If thy hand offend thee cut it off." In this miserable state he had walked over fifteen miles to the town where he was found and taken to the hospital.

EXTRAORDINARY MORAL INSANITY.

Jane Toppan, the poisoner of 31 persons, after 2½ years' confinement in the insane hospital at Taunton, Mass., is approaching—has reached—the secondary stage of her ailment, moral insanity, and is believed to be near her end. Until within a short period the visitor to the hospital was unable to observe even the least trace of insanity. The question used to be asked, "Why is she here? She

Pens at the Chicago Stock Yards showing distribution of individual lots of cattle.

seems to be as sane as her attendants." But now her mental delusions are frequent, almost constant, and were any one outside to see her there would be no doubt of the appropriateness of her incarceration.

She has abandoned the careless, cheerful frame of mind in which she has heretofore been and is now fretful, peevish, even ugly, faultfinding, fearful of eating because of suspected poison, complaining of her treatment, morose—everything but remorseful. The intellectual insanity, following the moral insanity with which it is now believed Jane Toppan has been afflicted from birth, will in all probability result in her death, possibly within a twelvemonth. She has dwindled to almost a skeleton.

Dr. R. H. Stedman, of Boston, one of the three alienists upon whose certificate the woman was committed, and who has made her case a study ever since, says: "In this after history we find brought into bold relief the inherent, underlying defect of weakmindedness which was noted, but only obscurely seen earlier for want of opportunity for proper observation, and also the outgrowth therefrom of pronounced intellectual change in the shape of positive delusions. These, together with the other and characteristic manifestations, afford the strongest confirmation of the patient's insanity, intellectual and moral."

In the course of his discussion of the case Dr. Stedman says further:

"The development of a delusional state in the course of moral insanity is apparently not uncommon and affords another and strong argument for the contention that intellectual involvement in some form is an essential feature of the disease, or, in other words, that there is no such thing as a mental disorder affecting the moral sphere alone."

A MEDICO-LEGAL CLASSIC.

This case of Jane Toppan will ever be a medico-legal classic. As a child she was noted as a mischiefmaker; her foster-mother was obliged to send her from home because she continually told lies. Yet when she became a nurse she developed qualities which made her agreeable, even loved, and when she was arrested some of her former patients evinced far more concern than she herself. Indeed, from the day of her arrest Jane Toppan has never shown fear of consequences, much less remorse for her murders. Poison had become a habit of her life, she told the examining physicians.

In planning and carrying out her homicidal acts she was, she asserted, always calm and clear-headed. After administering the poisons she experienced great relief and went to bed and slept soundly. "Why don't I grieve over it and feel sorry?" she asked.

The world shuddered when Jane Toppan was arrested and her crimes were told in print. Dr. Stedman has evidence to substantiate 20 of the murders to which she confesses; the other eleven are beyond investigation. In two instances she claimed to have been seized with compunction and to have sent for another nurse. One of the patients was saved in consequence. In another instance she took the opportunity to repeat the dose and make sure of her victim. As said before, there was an utter absence of motive in all cases. The whole gamut

of human motives was run over by the investigators in vain. There was neither avarice nor hatred to inspire her. No sexual instinct had been perverted in her, as was at first supposed, nor was she a user of liquor or opium. It was an irresistible propensity which impelled her to kill her best friends, and to commit the four crimes of arson to which she also confessed. And here is where the case takes on a phase of extraordinary interest, not only to the medical and legal professions, but to the layman. In their report to the district attorney upon which the court committed the woman to the hospital, the physicians said:

DEGENERATIVE MORAL INSANITY.

"The salient features of the case which indicated more especially irresponsibility were: Lack of moral understanding, of natural feelings, and of the ordinary motives for conduct including criminal acts, also the general absence in her of sufficient self-control to restrain her from crime, and her disregard of consequences, as shown, for example, in continuing to poison patients in full knowledge that her guilt in other recent cases was suspected; by her desire to confess her guilt at the outset; her indifference to her fate, etc. These facts seemed to us to evidence her inability both to help doing what she did and to be affected by punishment, conditions which are the best tests of accountability."

To this Dr. Stedman adds:

"Moral insanity belongs to the group known as insanities of degeneration, and is better termed degenerative insanity of the moral type. It should be exclusively reserved to designate a congenital, primary, constitutional and permanent mental condition affecting the moral nature and unassociated with evident intellectual impairment. These patients have good memory and understanding, ability to reason and contrive, much cleverness and cunning, and a general appearance of rationality, coexistent with very deficient control, absence of moral sense and human sentiments and feelings, perverted and brutal instincts, and propensities for criminal acts of various kinds which may be perpetrated deliberately and cleverly planned, yet committed with little or no motive and regardless of the consequences to themselves and others. This latter point is important as indicative of a perversion of the fundamental instinct of self-preservation (Kellogg). In their general conduct, also, these individuals are rarely governed by the same motives that govern sane people, whether criminals or not, and it is often difficult to see what the motive is."

Jane Toppan is now 45 years old. Not much has been ascertained of her earliest life; but it is known that she and her sister were placed in a foundling hospital by their father, an eccentric man who drank freely. The sister is a respectable and capable woman. A younger sister is a chronic insane patient. A third sister led a dissolute life and is dead.

The kind and Christian training which Mrs. Toppan gave her ward (whose name had been Honora Kelly) was thrown away; her incorrigible propensities for deceit, falsehood and trouble-making, never absent from the first, proved too much, and she was sent away.

It is thus evident that her taint is in-

born. Once she told Dr. Stedman: "I seem to have a sort of paralysis of thought and reason. Something comes over me; I don't know what it is. I have an uncontrollable desire to give poison without regard to consequences."

All her poisoning was done with opium, with a fatal dose of atropine, and the draught was so given in Hunyadi water as to be unsuspected by the patient and by the physician as well.

HYPNOTISM AND CRIME.

Arrested on the charge of shoplifting, a woman being tried in one of the New York City courts offered in defense the plea that she was impelled to the act of theft by a person who had hypnotized her.

This remarkable excuse presents a difficult question for the jury to decide, as it is one about which even scientists who have studied the phenomena of hypnotism are not agreed.

Few cases are on record in which this plea of irresponsibility was used successfully in defense of a prisoner charged with committing a criminal act. In one instance the celebrated nerve specialist, Kraft-Ebbing, gave testimony which secured the release of a prisoner who claimed to have acted under the influence of hypnotism, but subsequently this woman, who was a professional shoplifter, admitted that she had deceived the learned medical man.

In another similar case a woman was discharged and the three actual perpetrators of the crime were punished.

Several years ago a committee was appointed by the French government to determine whether it is possible for one person to cause another, who is hypnotized, to sign receipts for money not received, and whether a hypnotized person could be induced to execute a will in favor of any person determined by the party making the experiment. Both questions were answered in the affirmative. But these conclusions, it appears, were largely based on analogy and on work which was done in the laboratory. No case is on record in which either of the above acts was committed in actual practice.

A number of trials have resulted in the conviction of men who have been accused of taking advantage of women whom they had hypnotized.

Experimentally, there is not much evidence that hypnotism is of practical use in the commission of crime.

Those who take this view say that while it is possible, without the least difficulty, to induce a hypnotized person to do what is asked, the subject will still retain a certain power of control over his actions and will stop short of doing anything illegal or harmful to another. The hypnotized person will at once fire an unloaded pistol at his dearest friend, if the suggestion is given him.

TEST EXPERIMENTS.

Some investigators insist that the subject will likewise discharge a loaded pistol if instructed to do so, and challenge the doubters to try the experiment if they are so certain that no harm would result.

The following experiments have been performed:

A young woman who was hypnotized was told to pour the contents of an inkstand over her elegant light dress. She did not obey.

A subject who carried out the instruction of assuming the character of an officer or a sailor was conscientiously restrained from acting the part of a priest.

A woman was told to stab a man, which she at once did, with a card which had been placed in her hand. A knife was then given to her and the instruction again given. She raised her hand, but did not attempt to strike.

A Jewess was hypnotized on a Saturday, when it is forbidden an orthodox Jew to accept money, and offered a gold coin. She refused to take it.

Why more advantage is not taken of hypnotizable people to carry out criminal acts when such would seem to be a convenient method of violating the law is easily answered.

In the first place it is generally believed that only a person with evil tendencies can be used as a tool. It would be safer to make a confederate of such a person than trust to the complicated and clumsy method of hypnotism.

Then many people cannot be hypnotized, and of those whom it is possible to get under influence some may, and many often do, awake when the experimenter least expects it. Besides, complete loss of memory of what takes place during hypnosis is not universal. A still further drawback is the fact that the hypnotized person would act like a machine without regard to surrounding conditions and would take no precautions to avoid detection. He would blindly follow the instruction given, but his actions would surely attract the attention of people who would see him. To avoid the mechanical movements of the hypnotized person, it would be necessary to give suggestions to him covering every possible combination of contingencies, and this would present difficulties so great as to hardly warrant the risky attempt. A recent writer on the subject says that he considers the danger of detection so great that a less practical method could hardly be selected.

CIVIL LAW ON HYPNOTISM.

In most European countries only medical men are permitted to practice hypnotism.

Russian law forbids a physician to hypnotize a patient unless there are other medical men present. And even then it is first necessary to notify the local administrative authorities of the exact day and hour on which the proposed seance will take place and the names of the witnesses must be given. Publications on hypnotism which may be accessible to the ordinary reader must be submitted to a censorship. No public exhibitions may be given outside of clinics or hospitals.

That hypnotism has an injurious effect, both physical and moral, is now generally conceded by all well qualified men who have seriously considered the matter. Medical authorities all over the world have pointed out its dangers.

One writer on the subject, whose experience qualifies him to express an opinion, states that the risk of mental deterioration from the frequent induction of the hypnotic state, especially for those of a nervous temperament, is distinctly dangerous. For this reason alone there is good cause why there ought to be

passed a law in the United States to restrict the practice of hypnotism to the medical profession.

In France its use is forbidden even for therapeutic purposes in the military and naval hospitals. Charcot, the great French neurologist, who was largely responsible for the revival of the hypnotic form of treatment, almost completely abandoned its use during the last years of his life. At present it seems destined to be regarded more as a medical curiosity than as a useful form of treatment.

Bernheim, a medical man with an enormous experience with hypnotism, once had the misfortune to lose a patient whom he had put under hypnotic influence. The man he was treating was suffering from pain caused by some inflamed veins of one leg, and he was put to sleep to relieve the distress which this trouble caused him. The man died in two hours.

Lombroso reported the case of an officer who had been hypnotized at a public seance and who later on was accustomed to fall into the hypnotic condition at the sight of any shining object. One night on approaching an advancing carriage which carried a lamp the officer became unconscious and would have fallen and been crushed to death had not a comrade rescued him.

A young woman who had been hypnotized by the aid of a gong subsequently developed a tendency to go into spontaneous trance when she heard any regular or monotonous sound. One day crossing a crowded street as the church bells were ringing she staggered and fell under the wheels of a passing vehicle and was killed.

As hypnotism is beneficial only in those functional diseases which rarely endanger life, and for which many other well known and less dangerous and simpler remedies may be employed, it would seem as if hypnotism as a means of cure has a restricted field in which it must be used by medical men; and as its manifestations are pathological rather than physiological, there is every reason to demand that a law should be enacted to prevent its indiscriminate use by the laity.

CRIME AS A HEREDITARY DISEASE.

VIEWS OF A NOTED REFORMER OF CRIMINALS.

"Every man is born to crime; it is innate within him," says Mr. John L. Whitman. "The child's first impulse after realization is to destroy, to do something that it ought not to do. The crime germ is in every human body. In many it never takes effect, or when it does the power to resist it is strong and the disease is conquered, but in others it overcomes the powers of resistance, and the victim is crimesick. It develops until the man or woman becomes a Christian savage, and then society must cure him of the ailment.

CALLS CRIME A DISEASE.

"Crime is a disease. Criminologists are agreed upon that point. When a man becomes crimesick the great problem is to cure him, and that is now one of the greatest problems of society. Accepting that crime is a disease, we must awaken

to the fact that our jails and prisons are hospitals, and not institutions where the crimesick man must be mistreated and driven to hate society upon which he will be turned with the disease within more malignant, seeking to wreak vengeance upon society, his persecutor.

"Penal laws do not prevent crime; it is the enforcement of the spirit of the law alone that will prevent crime, and enforcement of the spirit of the law is to cure men of the crime disease. The physically sick are treated for their ailment. If they are cured it is well, but if they die they pass out of society and society goes on as before. But the crimesick man is a great menace to society and he must be cured or when turned upon society from the prison he spreads the germs with fearful effect to humanity in general.

CAN BE CURED BY TREATMENT.

"It is in the treatment of the prisoner that the disease can be cured, but the old idea of punishment of criminals only serves to increase the disease and not to cure it. In our jails we must teach men the higher principles of life. Show them the light by appealing to their manhood, their pride, their honor, and impress them with the fact that society wants them to return as one of its protectors. It is the spirit of the law that demands the cure of criminals; the letter of the law enforced puts men in the hospitals where they may be cured.

"When society thoroughly awakens to the demand in the treatment of its criminals that they be cured of their crimesickness and not locked up within cold prison walls for punishment alone humanity will be better off and crime will rapidly disappear."

FINAL DISUSE OF THE FIVE SENSES.

A time will come, perhaps—and many things there are which herald its approach—a time will come, perhaps, when our souls will know of each other without the intermediary of the senses.

Certain it is that there passes not a day but the soul adds to its ever widening domain. It is very much nearer to our visible self and takes a far greater part in all our actions than was the case two or three centuries ago.

A spiritual epoch is perhaps upon us, an epoch to which a certain number of analogies are found in history. For there are periods recorded when the soul in obedience to unknown laws seemed to rise to the very surface of humanity, whence it gave clearest evidence of its existence and of its power. And this existence and this power reveal themselves in countless ways, diverse and unforeseen.

It would seem at moments such as these as though humanity were on the point of struggling from beneath the crushing burden of matter that weighs it down.

A spiritual influence is abroad that soothes and comforts and the sternest, direst laws of nature yield here and there.

Men are nearer to themselves, nearer to their brethren: in the look of their eyes, in the love of their hearts there is deeper earnestness and tenderer fellowship. Their understanding of women, children, animals, plants—nay, of all things—becomes more profound. The statues, paintings and writings that these men have left us may, perhaps, not be

perfect, but none the less does there dwell therein a secret power, an indescribable grace held captive and imperishable forever.

A mysterious brotherhood and love must have shone forth from the eyes of these men and signs of a life that we cannot explain are everywhere vibrating by the side of the life of every day.

Such knowledge as we possess of ancient Egypt induces us to believe that she passed through one of these spiritual epochs.

SOUL DEVELOPMENT IN INDIA.

At a very remote period in the history of India the soul must have drawn very near to the surface of life, to a point indeed that it has never since touched, and up to this day strange phenomena owe their being to the recollection or lingering remnants of its almost immediate presence.

Many other similar moments there have been when the spiritual element seemed to be struggling far down in the depths of humanity like a drowning man battling for life beneath the waters of a great river.

Bethink you of Persia, for instance, of Alexandria, and the two mystic centuries of the Middle Ages.

Today the soul is making a mighty effort. Its manifestations are everywhere and they are strangely urgent, pressing, imperious even, as though the order had been given and no time must be lost.

It must be preparing for a decisive struggle and none can foretell the issues that may be dependent on the result, be this victory or flight.

Perhaps never to this day has it enlisted in its service such diverse irresistible forces. It is as though an invisible wall hemmed it in and one knows not whether it be quivering in its death throb or quickened by a new life.

OCCULT POWERS.

I will say nothing of the occult powers of which signs are everywhere, of magnetism, telepathy, levitation, the unsuspected properties of radiating matter and countless other phenomena that are battering down the door of orthodox science.

These things are known by all men and may easily be verified. And truly they may well be the merest bagatelle by the side of the vast upheaval that is actually in progress, for the soul is like a dreamer, enthralled by sleep, who struggles with all his might to move an arm or raise an eyelid.

Other regions there are where its actions are even more effective, though the crowd there is less regardful and none but trained eyes can see.

Does it not seem as though the supreme cry of the soul were at last about to pierce the dense clouds of error that still envelop it in music?

Do not certain pictures by foreign painters reveal the sacred majesty of an invisible presence, as it never has been revealed before?

Are there not masterpieces in literature that are illumined by a flame which differs in its very essence from the stranger beacon fires that lit up the writings of bygone days?

Spiritual phenomena to which in former days even the greatest and wisest of our brethren scarcely gave a thought are today being earnestly studied by the very

smallest, and here are we shown again that the human soul is a plant of matchless unity whose branches when the hour has come all burst into blossom together.

The peasant to whom the power of expressing that which lies in his soul should suddenly be given would at this moment pour forth ideas that were not yet in the soul of Racine.

And thus it is that men of genius much inferior to that of Shakespeare or Racine have yet had revealed to them glimpses of a secret luminous life, whose outer crust alone had come within the ken of those masters.

For, however great the soul, it avails not that it should wander in isolation through space or time. Unaided it can do but little. It is the flower of the multitude.

When the spiritual sea is storm-tossed and its whole surface restless and troubled there is the moment ripe for the mighty soul to appear; but if it came at time of slumber its utterance will be but of the dreams of sleep.

Hamlet at Elsinore at every moment advances to the very brink of awakening, and yet though his haggard face be damp with icy sweat, there are words that today would doubtless flow readily from his lips because the soul of the passer-by, be he tramp or thief, could be there to help him.

For in truth it would seem that already there are fewer veils that wrap the soul and were Hamlet now to look into the eyes of his mother or of Claudius there would be revealed to him the things that then he did not know.

FEELING THE PRESENCE OF EVIL.

Is it thoroughly clear to you that if there be evil in your heart your mere presence will probably proclaim it today a hundred times more clearly than would have been the case two or three centuries ago?

Though you assume the face of a saint, a hero or a martyr, the eye of the passing child will not greet you with the same unapproachable smile, if there lurk within you an evil thought, an injustice or a brother's tears.

It is felt on all sides that the conditions of work-a-day life are changing and the youngest of us already differ entirely in speech and action from the men of the preceding generation. A mass of useless conventions, habits, pretenses and intermediaries are being swept into the gulf, and it is by the invisible alone that, though we know it not, nearly all of us judge each other.

THE SIXTH SENSE.

OPINIONS OF A SCIENTIST ON TELEPATHY AND CLAIRVOYANCE.

Time was when I believed that human beings were gradually evolving a sixth sense, or a psychic method of receiving impressions, or becoming conscious of touch through another and mysterious avenue, than the well known five senses of receiving outside information. I now believe that we have evolved or are evolving out of that condition into the higher state of reason. I make this statement knowing full well that detectives may

follow, for other symptoms of insanity, and that they may even break into my shanty, catch me asleep and in their zeal to display bravery, shoot me to death. However, I propose to furnish my readers with some of the simple facts which point to reason as the very highest order of life, viz., receiving information, yet reached by the highest order of the white (Caucasian) male human being. I believe that it is generally conceded, and will not be denied, that psychic powers are closely related to animal "instinct," as it is called. It is well known that animals inherit at birth certain knowledge, or "instinct," which they make use of to a much larger extent than do the young of human beings; and yet when the experimenting and reasoning powers of the human babe are matured he is the master and director of all other life and phenomena. When the young chick breaks through the shell and draws his first breath of air he is standing upon his feet, with his eyes open, and knows exactly what to do next; that is to say, he feels the directing forces upon his protoplasm, which the babe does not feel and could not obey if he felt them. The human babe is the most helpless of all creatures, more so than a sponge, oyster or common weed. If not taken care of by others he would perish in a short time. Instinct or psychic means of receiving information has given place to reason on account of the gradual increased use of reason and the decreasing use of psychic feeling by his ancestors.

TELEPATHY AS AN EXPLANATION OF CHRIST'S CONSTANT REFERENCE TO PURITY OF HEART.

To particularize one matter, how much more significant and important the underlying principle of the Sermon on the Mount becomes in the light of telepathy. Jesus Christ insists on the necessity of keeping the heart right; the thought perfectly pure. His demands in this regard are severe and exacting in the extreme, so much so that it has been found difficult to explain them on reasonable grounds. The feeling of anger against a brother is represented as a crime as culpable and heinous as murder; the adulterous thought is adultery as certainly as though the act had been performed. It is easier to understand these sayings of His if what has been suggested about telepathy is true. Let it be granted that every movement of the mind sets the ether in motion, and that any person, distant or near, whose mind is at that moment strung to the same pitch—that is, is possessed by similar feeling—is thereby made peculiarly susceptible to these vibrations; it will be seen that all the mental activities of a man are not only exercising a large influence on his own character and on the life of his neighbors, but must be a potent factor in determining the conduct of large numbers of people whom he has never seen and of whom he has no knowledge.

HOW ANGER MEANS MURDER.

He one day becomes furiously angry with his neighbor. But for the restraints of the law and of the public opinion under which he lives he would kill him. The

incident passes, and it seems to him that nothing has happened. But next day the newspapers inform him that there has been a horrible murder in another part of the country. It occurred at the moment of his own fit of angry feeling. He sees no connection between the two; and yet, but for the ether vibrations he set in motion, and which struck the brain of the man who is now a murderer, the crime would probably—at least it might—not have been committed. Or he allows his mind to dwell long on the unclean thought, but commits no wrong act. Another man, however, less completely under control, is driven to do something infamous by reason of the etheric undulations he has started. In a larger sense than we have imagined, if this account of telepathy be true, every man is responsible for his brother's conduct; he may be influencing towards good or evil both those whom he knows and great numbers of whose existence even he is ignorant, and who are living thousands of miles distant from him. And if Jesus Christ knew this to be so, the reason of His strong words will be quite apparent.

A study in barnacles: The "Kaiser Friedrich" in dry dock after a voyage. The above extraordinary photograph was taken at Kiel, and shows the curious disguise with which Neptune had adorned the helm, screw, and bottom of the great German warship.

OPINIONS OF A DISBELIEVER.

"Telepathy," Mr. Lang tells us, "is quite an old idea. Bacon calls it 'sympathy' between two distant minds, sympathy so strong that one communicates with the other without using the recognized channels of the senses. Izaak Walton explains in the same way Dr. Donne's vision, in Paris, of his wife and dead child. 'If two lutes are strung to an ex-

act harmony, and one is struck, the other sounds,' argues Walton." Yes, if the lutes are close to each other; but let one lute be in London and the other in South Africa, though one be struck never so loudly the other will remain silent. "Two minds," continues Mr. Lang, "may be as harmoniously attuned and communicate one with the other. Of course, in the case of the lutes, there are actual vibrations, physical facts. But we know nothing of vibrations in the brain which can traverse space to another brain." We certainly know nothing of such vibrations, nor is there anything worthy of the name of evidence in favor of such intercommunication between brains, living or dead. In the case of the dead the suggestion is somewhat strange, for the idea of the departed possessing a brain is certainly a novel one.

EMINENT SCIENTISTS ASTRAY.

Yet this belief has received the patronage of at least one man of science, for Sir William Crookes, speaking as president of the British association, talked of "the fundamental law that thoughts and images may be transferred from one mind to another without the agency of the recognized organs of sense." Why such a law, if such there be, should be termed "fundamental" it seems impossible to say. It would appear to be no more "fundamental" than any other natural law. But is there any such law? Or, if so, can it operate when thousands of miles separate the one brain from the other? Most assuredly we shall not accept the statement on the *ipse dixit* of any scientific man, however eminent. It is well known that a man may have great scientific attainments, and yet, by the constitution of his mind and character, be quite unfitted to weigh and sift evidence; to disentangle the truth from the mazes of human falsehood and human credulity. Learned professors of science have not unfrequently been taken in by the vulgar imposture of a spiritualistic medium whose tricks have subsequently been detected and exposed by men of far less eminence but of more practical knowledge and experience.

I submit, then, that there is nothing which can be called evidence in favor of this wonderful supposed law or faculty. Most alleged cases may be explained with certainty as simple coincidences. Thousands of mothers, for example, think of their sons in distant regions, long to see them, are extremely anxious about them, and it not unfrequently happens that one of these anxious mothers dreams of her son, or even has an "hallucination" that he has appeared to her. In ninety-nine cases out of a hundred nothing further happens and nothing further is said about the dream or appearance; but in the hundredth case the mother receives news that her son is dead. The story is repeated on all hands. How mysterious! "A clear case of spiritual appearance," say the believers in the supernatural. "A clear case of telepathy," say the pseudo-scientists of modern times. It is neither the one nor the other. It is a case of the law (shall we say "fundamental" law?) of chances. Where millions of shots are always being fired at the target it would be strange indeed if some did not hit now and then.

THE FASCINATION OF THE MYSTERIOUS.

In truth, there is quite as much so-called evidence for witchcraft and demonology and medieval miracles, and many other discarded superstitions, as there is for the ghost-story of modern civilization. But the ghost-story is popular, and probably will ever be so. There is a fascination even for the skeptic about the weird and the mysterious. Moreover, with many people the wish to believe in ghosts is strong, for therein they would fain find an assurance of an after-life. Therefore, the ghost-story is probably destined to endure. But "believe it not, my son!" Neither believe thou their psuedo-scientific theories of "telepathy," whether between the living or between the living and the dead—at least until they have produced such real evidence as shall satisfy the trained minds of scientific men—not one or two "cranks" only; and this, I think, they are likely to do somewhere about the Greek Kalends. No doubt there are more things in heaven and earth than are dreamed of in our philosophy, and when they are proved to exist we will believe in them—but not till then.

CLAIMS FOLLOWED TO ABSURDITY.

Here is a strange yet absolutely true story, in which a clock plays a mysterious part. It was a small American timepiece, which stood on a mantelpiece in a sitting-room in a Liverpool builder's house. At a quarter past eleven one morning a few weeks ago the timepiece fell from the mantelpiece to the floor. When picked up it was found to be quite uninjured and still going, as if nothing unusual had happened. There seemed to be absolutely no reason why it should have fallen, but an hour later, when the builder came home to his midday meal, he remarked that at a quarter past eleven he fell from the top of a building, but happily without sustaining any injury. His wife then described how the clock had fallen at the same time, and the couple ponder in vain over the curious and utterly inexplicable coincident.

CURIOSITIES OF SLEEP AND THEORIES OF DREAMS.

Professor Richard A. Proctor, a noted scientific writer, held the belief that the "memory for form" on which success, in drawing, in sculpture, in wood carving, and in all the "graphic and plastic arts" depends, shows its realities far more fully in dreaming than it usually does in waking, and that this process of memory uncontrolled by circumstances or will is the explanation of dreams.

Of course, the extent of the final success of any draughtsman, any designer who, on paper, in marble, metal or any other material, imitates the forms of nature, must depend finally on the readiness with which he cannot only remember, but recollect or recall at will the forms through which he seeks to express his ideas. Otherwise, he must remain either a copyist of the work of others, or, if he works directly from his own models in nature, he must work in their presence or rely on his own actual records made in their presence.

The memory for form seems to be the first memory developed, but the power of using it through recollection seems to be generally superseded by the habit of relying wholly, or almost wholly, on words as soon as they begin to be used instead of the forms for which they stand.

A noted scientific writer in commenting on this theory, says: "It seems to me that, asleep or awake, this memory is the same, though, in most of us, it is only in sleep that it operates easily, quickly and without conscious effort through processes of recollection which, if attempted when awake, soon become too laborious to follow further. These same processes enter also into dreams when we are dreaming in words, a laborious and tiresome method, which belongs to the second nature resulting from education, rather than to original nature."

DISORDERED NERVES.

Another species of form memory belongs to disordered nerves acting specially through the nerve centres of vision, though it acts also at times through the nerves of hearing. In this, a person who is fully awake sees "projected" into seeming reality before him, the most startling lifelike creations of his own power of "creating images." This may happen without "intemperance," or, at least, without the intemperate use of alcoholic stimulants, which are its most familiar cause. A noted scientist of approved sobriety and temperance in everything except work saw a building in which he was greatly interested torn down. On passing the site some time afterward, he was at first immeasurably astonished to see the building standing as he had known it for years, complete in all its parts. Being in full possession of his judgment and all other intellectual faculties, he stopped and observed the illusion as long as it lasted, and recorded his experience for the benefit of expert students of the conditions of extreme nervous overstrain, from which he knew, as a result of this "projection" that he was suffering.

It is possible that in the case of sight the mental image which usually appears only in dreams might be called up and "projected" at will, as an illusion of form and color, by a process of education directed to that end. But no doubt the nerves thus educated would be much more liable to disorder than they would otherwise, and the faculty itself might at any time begin to develop its "projections" in spite of the effort of the will to prevent it.

CAUSES OF DREAMS.

Maury, while a child, dreamed that his head was being hammered on the anvil of a smithy, and discovered on awaking that a blacksmith was in fact making horseshoes in a neighboring building. When grown up, he dreamed that he was about to be guillotined, and woke up to find that a lath from the head of the bed had fallen and was pressing upon his neck. Dr. Gregory, in like manner, went to sleep with a hot-water bottle at his feet and dreamed that he was climbing Mount Etna and walking over hot lava. So it has been shown by

actual experiment that water dropped into the open mouth of a sleeper will make him dream that he is swimming, a silk handkerchief laid over the mouth and nose that he is suffocated or buried alive, and a mustard plaster laid on the head that he is being scalped by Indians. The strength of such sensory impressions, which may even translate themselves into actions without awaking the sleeper, may be easily observed in the case of dogs asleep before a fire, who will often move their paws and open cry as if they were actually hunting. In this case, it is probably the increased flow of blood to the legs caused by the heat of the fire which is the determining cause of the dream.

PERSONS DREAMING ALIKE.

From this it might be gathered that everyone in the same circumstances would dream the same thing, and to a certain extent this is no doubt true. The tendency of shipwrecked sailors upon short allowance of food and drink to dream of abundant dishes and flowing streams has often been noted, and it is said that the dreams of soldiers the night before the battle often bear a strong family likeness to each other. So, too, we can explain the practice of "incubation" in many ancient temples, where he who would enquire of the god was allowed to sleep near the shrine, and generally managed to dream something which could be twisted into an answer to the question he had come to ask. But it should be remembered that the concepts of our waking moments are never simple, but are largely made up of memories of our former impressions, and it is not reasonable to expect that our sleeping concepts should differ from them. Just as an artist and farmer see different things when they look at a beautiful landscape, so does the personal equation count for much in dreams. Dr. Maudsley tells us that in his experience those whom years of practice in observation and reflection have trained to think coherently will alone have coherent dreams; while M. Lorain says that the amount of cerebral activity manifested by the individual during the day is the measure of cerebral capacity shown by him in dreamland. People who do not use their brains much—children, women, and handicraftsmen, as he rather ungallantly puts it—according to this last, seldom show any intellectual power in their dreams.

WHAT DREAMS ARE MADE OF.

So far, therefore, it might be said that all our dreams are composed of impressions received from the outer world, and this would be the end of the matter were man only the "bundle of sensations" that Kingsley's Aben Ezra once thought himself. But the fact that the great organs of the body—the heart, the lungs, and the liver—continue to work when the senses are drowned in sleep, shows that this is not so, and that behind the "moi sensoriel," or sensory self, there stands the "moi splanchnique," or visceral self, which discharges all the functions necessary to the maintenance of life and well-being without reference to the individual consciousness. What part this second personality within us plays in the composition of our dreams is not yet clear, and it is possible that it never does so directly, but only by such a disarrangement or in-

terruption of the machinery as forces itself upon the attention of the senses The question seems for the present to be outside the range of experiment, but it appears to be well established that any lesion of the more important viscera, such as paralysis, locomotor ataxia, and certain forms of heart and lung disease herald their approach by nightly-recurring dreams of the most terrifying character.

Subject to this, however, the theory that dreams are made up of past and present impressions holds the field, and this receives nightly confirmation in the case of most of us. Fantastic and odd as our dreams—or rather what we remember of them—appear to our waking minds, patient analysis generally decomposes them into a sort of kaleidoscopic combination of sensations received during sleep with the events or thoughts occurring to us in the past. Those who go from one country to another where people and customs are very different, such as Japanese in America, say that for the first six months, or even more than a year, all their dreams are in scenes of the old home. After several years spent in America, it requires similar time when they return home for their dreams to change from scenes of America.

HOW TO CAUSE AND MANAGE DREAMS.

Nerve specialists have recently proven beyond a doubt that pleasant, as well as bad dreams can be readily made to order.

An experimenter who bandages his subjects' feet in splints which bend down their insteps until they are almost in line with the shin bones finds that dreams of dancing, walking or running on tip-toe are induced.

If hideous faces haunt your dreams, as is common, they may be replaced by pleasing ones if you will gaze with great concentration upon pictures of beautiful faces just before you settle down to slumber.

A course of experiments covering seven years has shown that dreams of certain colors may be induced by causing the subject to gaze steadily at disks or through glass, of the desired hue, placed before his eyes in such manner as will cause surprise just before retiring.

That cold compresses applied to the head will prevent bad dreams is also noted. A layer of cotton wool bound over the forehead will, by increasing the temperature of the head, cause either pleasant or unpleasant dreams to become more vivid and intelligent.

By placing the sleeper on his right side his dreams are made absurd, extravagant and of a remote time, while those experienced while he lies upon his left side are reasonable and of a recent time. Sleeping upon the back produces agitated dreams.

Bad dreams are dissipated also by placing a lighted candle in the otherwise darkened room of the sleeper.

APPLICATIONS TO FEET.

A hot-water bottle applied to the feet of one sleeping subject caused him to dream that he was walking over hot lava, while to another it conjured up the dream picture that he was being led by Satan

over the flaming marl of hell. Another so treated dreamed that some Mexicans were holding his feet to a flame to make him confess the secrets of alchemy. A woman subject of the same experiment dreamed that she was a bear being taught to dance over hot iron plates.

Applying to the feet a cloth saturated with ice water will usually induce a dream of walking over snow or ice in the bare feet. Uncovering the sleeper's feet and legs to the atmosphere of a cold room will usually induce the dream that he is walking somewhere divested of his nether garments—a dream which occurs to us often and which is accompanied by a sense of deep embarrassment, for we usually picture ourselves in a public place, gazed upon by astonished multitudes. And when we awake we find that we have kicked off the covers.

Dreams of flying through the air are induced by admitting a strong draught of air to the room of the sleeper and allowing it to blow over his bed. It is also said that those who sleep face downward are especially liable to dream of flying, from the rhythmic rise and fall of the chest in breathing. Tickling the sleeper with a horsehair or a straw will induce dreams of insects, which often assume marvelous proportions and hideous forms. The sharp banging of a door often suggests a dream in which the report of a gun or pistol is heard. Shadows flitting about the room are believed to supply much food for dreaming.

DREAM SENSES.

In dreams we see more than we hear. During a dream storm we often see the lightning, but seldom hear the thunder. While dreaming we furthermore hear more than we feel, feel more than we taste and taste more than we smell. It has been demonstrated that the ear is more sensitive during sleep than in waking moments. It receives innumerable molecular vibrations otherwise imperceptible.

Odors perceived during sleep also form food for dreaming. A physician required to spend the night at the ill-smelling place of a cheesemonger dreamed that he was sealed up in an immense hollow cheese, where an army of rats were running over his naked body.

Tastes exert a similar agency. Former Surgeon General Hammond, U. S. A., told the story of a young woman who put aloes on her thumb to cure her baby habit of sucking that member. She dreamed that she crossed the ocean in a vessel of wormwood, and that she tasted its bitterness whenever eating or drinking. Her dream took her to England, where a physician treated her with ox gall, and to Rome, where the Pope ordered her to eat a piece of Lot's wife turned to salt, from whom she broke a thumb, which she placed in her mouth. When she awoke she was sucking her own thumb and all of the aloes had disappeared.

A neurologist applies in his dream studies an opththalmoscope—the glass commonly used by oculists to examine the inner workings of the eye. He has discovered that much of the real food for dreams is contributed by opaque particles upon the eye, and that these in the waking state appear projected into space as spots, lines, drops and twisted bodies.

SEEING SNAKES.

The dreaming eye actually sees, although the sleeping room be pitch dark. Proteplasm in every cell of the body contains phosphorus. The eyelid is to a certain extent luminous and in the dark serves as a screen against which foreign substances in the eye are seen. Twitching blood vessels and their corpuscles are similarly shadowed. All of these objects appear to be five or six feet away. Their dark shadows are believed by this specialist to suggest the objects which set the dream mechanism in motion. The changing blood pressure through the retina is found to produce various colors.

Why drunkards "see snakes" was lately learned by aid of the ophthalmoscope applied to alcoholics. During delirium tremens and other advanced stages of alcoholism the blood vessels of the retina enlarge and are black with congested blood. Their movements projected upon the field of dream vision appear exactly like the twisting and squirming of serpents.

In the dreaming state the mind is found to work backward. Effect suggests cause, whereas, to the waking consciousness, cause suggests effect. A breeze blowing over us produces an effect which, when we are asleep, suggests as a probable cause that we are flying through the air. But the dreaming brain, like the savage brain, has but feeble appreciation of the logical relation of cause and effect. Simple resemblances of form, color, sound, etc., will bring together dream images without any sensible relationship. Bad dreams are sometimes so vivid as to drive men to permanent insanity. Cowper's madness is said to have been due to this cause.

Association plays an important part in our dreams. A man who, while living abroad where a peculiar perfume was commonly used, invariably dreamed of that place when this perfume was dropped upon his pillow during sleep.

We often dream our dream images for some seconds after awakening. They are discovered to remain as long as the position of the eye continues unchanged. This phenomenon is offered as an explanation for many ghosts claimed to be seen immediately after slumber, before the dream itself is yet remembered.

Dreams are caused by small quantities of blood left in the vessels of the brain. Sleep results from a draining of the blood in the brain, as has been proved by a series of experiments in which the skulls of dogs were trephined, the extracted buttons of bone being replaced by watch crystals. Through these disks of glass it was noticed that when the animals fell asleep their brains, previously red, would turn pale and collapse. At the instant of awakening the blood returned. A touch, sound or other stimulus to the senses during sleep would cause the brain to grow larger and become more saturated with blood. Insomnia results from any overstrain of mind or body which dilates the blood vessels of the brain.

ACTUALLY WEIGHS DREAMS.

An instrument which demonstrates the relationship between dreams and brain circulation is known as the "tilt board." A long tray, about the length and width of a coffin, but more shallow, is occupied by a man lying supine. He is so arranged that during his waking state the tray balances exactly upon a knife blade. He

is then put to sleep with the aid of an "alouette"—or hypnotic mirror. As sleep gradually overpowers him the half of this scientific seesaw containing his head gently rises, and when deep sleep has set in the end containing his feet drops upon a rest provided. When dreams are induced by any of the experimental methods described herein, the end of the tray containing the sleeping brain will descend to a depth proportionate to the dream's vividness.

The explanation of the experiment is very simple. As the brain is drained of blood for sleep the head becomes lighter and that end of the balance rises. As small quantities of blood return to supply the flitting dreams it falls slightly. Thus may our dreams be actually weighed.

MIRACLES.

HISTORY AND THEORIES OF MODERN WONDER WORKERS.

Ste. Anne de Beaupre, on the St. Lawrence twenty miles below Quebec, is the most noted faith-cure place in Canada. So great were the numbers of pilgrims to the shrine of Ste. Anne that a railroad was built solely to accommodate the afflicted travelers, and countless visitors attest to the most astonishing cures wrought there upon them.

Its origin is attributed to an incident in the early history of the settlement at Quebec. Some Breton sailors, overtaken in a terrific storm, prayed together this prayer: "O God, have mercy upon us, for our boats are so small and Thy sea is so large. Holy grandmother of Christ, look down pityingly upon us. Lead us safely to land and at the place where our feet touch; we will there erect to you a memorial chapel of our gratitude." Immediately the storm subsided and they were soon safely ashore at Petit Cap.

The little wooden chapel they erected was soon destroyed by storms. Louis Guimont, living near, decided that it must be rebuilt with stone. He was a sufferer afflicted with a disease that had kept him bent double for twenty years, but he determined to roll the first three stones to their places with his own hands, dedicating, as he did so, the first to the Savior, the next to his Holy Mother, and the next to his sainted grandmother.

The moment that the third stone was set in its place, a new vigor began to surge through his nerves and veins. He leaped up and proclaimed his miraculous cure through all the regions round about. The afflicted came from every direction to place a stone in the wonderful structure and with each was performed a new miracle.

Twelve years later the fame of the place had gone forth with such numbers of authentic cures that a dispensation was granted to recognize the presence there of the Saint by sending to it part of her finger bone. On March 12, 1670, it was for the first time solemnly exhibited to an adoring congregation, and since then it has been the greatest wonder-working shrine in America.

MARVELOUS CURES WHERE DOCTORS FAILED.

In a recent city fire a cripple received the use of his limbs under the most re-

markable circumstances. He had been used to crutches for a number of years, and for a long period was a helpless invalid. At the time of the outbreak he lay asleep in his attic bed, and it was feared that the firemen would be unable to reach him. But he was roused by the noise of the falling roofing and jumped from his bed in a terrible fright. Forgetful of his infirmities, he ran down stairs and into the street, and not until he was safe amongst the dense crowd of spectators did he realize the miraculous cure which the fright had wrought.

SAVED BY SHIPWRECK.

An equally wonderful cure was recorded on the occasion of the wreck of the steamship "Nepaul" on the Shagstone. On board the vessel was a gentleman who had been a helpless cripple for nearly twenty years. He could not move anywhere unassisted, and had to be wheeled about on a wicker bed-cart. He was lying on deck in this cart when the ship struck. White and trembling with fright, he sprang from the vehicle and dived into the sea. Fortunately, he was rescued, and ever since has had the free use of his legs, to the astonishment of the many London specialists who had all consistently declared him to be incurable.

Sight was restored to a blind shipwright in the Devonport dockyard by the miracle of fright. Oddly enough, it was in a similar accident to that which had caused his blindness. For thirty-two years he was totally blind, owing to a heavy blow on the head from a piece of iron falling from a huge tank in course of erection. About five years ago he was visiting the scene of his former labors, when a similar piece of work was in progress. Suddenly a beam gave way. The alarm was given, and in the rush "clear" the blind man ran to safety—and sight!

In the historic burning of Exeter Theatre a deaf mute received both speech and hearing. She was the adopted child of a cleaner, and when the terrible outbreak occurred she ran from the building screaming wildly. For several years her faculties remained apparently unimpaired, and then suddenly she again became deaf and dumb.

WALKED INTO THE SEA.

At Thurlestone the story is handed down from parents to children, of how a young lady named Murgaton regained speech. The poor young creature, besides being dumb, was an incurable somnambulist, and all the efforts of friends to cure or check her had been in vain. One midnight she rose in her nightgown, and passing out of the house, walked straight down to the beach and into the sea. The sudden chill roused her, and the sight of the roaring waters of the English Channel before her so alarmed her that she screamed for fright and rushed back to land, now thoroughly awake. Then her joy knew no bounds, for the terror had brought back to her the gift of speech, and she lived for many years after that event in the full enjoyment of all her faculties, and completely cured of sleep-walking.

Fright was also responsible for the now famous cure of Karl Effenbach, who had been paralyzed for over ten years. After frequent persuasions he decided to try the miraculous waters at Lourdes.

Cattle shute showing how the animals at the Chicago stockyards are driven to the slaughtering place.

The year he went the shrine was at the zenith of its fame, and it will be remembered that one day so great was the crowd that a panic was caused by a trifling accident, and many persons were injured in the stampede. What was the cause of terrible injuries to others brought relief to Effenbach. He was lying on the couch in the thick of the crowd, attended by a couple of friends. Then came the rush. The paralytic was terrified. He sprang from his couch and mingled with the surging throng. The couch was smashed to atoms. An hour later he was dancing with wild joy in his hotel, while his friends looked on amazed at the man who that morning had been carried a helpless invalid to the sacred water.

A railway collision at Clapham Junction a few years ago, brought sight to a gentleman who had been totally blind since his third year. He was traveling in a second-class compartment at the time of the accident, and was on his way to spend his summer holidays at Bournemouth. His wife was reading the day's news aloud to him, when crash the train went into another standing in the station. The panic was terrible, but the most tense scene was enacted in this compartment. The screams of his wife were drowned in his own exultant cries.

"I see! I see! I see!" he kept repeating, almost unheedful of the cause of the miracle. It all happened in a moment, for the carriage lurched over, and it was another miracle that its occupants escaped.

IN THE HOUR OF NEED.

"L-look out!" were the first words of a collier named Maddick after being dumb for fourteen years. Readers who have spent a holiday at merry Matlock know that at one part of the river boating accidents are common, unfortunately, often attended by loss of life. About three years ago this man, while strolling through the gardens, saw a boating party rapidly approaching a dangerous spot. Added to their ignorance of the river, they were incompetent oarsmen. He watched them for some time, but was quite unable to make his meaning clear to them by his frantic gestures. At length they were dangerously near the deathtrap, and almost immediately voice seemed to come to him, for he shouted with the strong lungs of a healthy man:

"L-look out!"

It saved the boaters, and the man has ever since been able to use his voice

FATIGUE—ARE WE EVER REALLY TIRED?—OPINIONS OF EMINENT SCIENTISTS.

Fatigue is a complex phenomenon; its most apparent manifestation is the gradual diminution of functional power—the difficulty of continuing work that has been begun. But there is in fatigue a considerable psychic element. The physical phenomena that are the consequence of prolonged labor give to the mind the autosuggestion of the impossibility of acting, considerably before this impossibility really supervenes. M. Dubois, of Berne, has with justice dwelt on this fact. He says:

"Soldiers are on the march; they have traversed a long road. They can go no farther and lie down by the roadside, declaring that they are incapable of going another step. Let an officer appear who

knows how to raise the morale of his troops, and let him order the band to play, and you will see these men take up their march almost at a quickstep.

"Were these men worn out? No; for in that case it would have been necessary to give them rest or food, or to leave them where they might be picked up by the ambulance. They were tired; but under the influence of fatigue their morale had weakened, and they viewed their fatigue through the magnifying-glass of their pessimism. The word of their chief, the music, put new life into them, enabling them to resume their march. The knowledge of imminent danger, or of the presence of an enemy, would have acted in the same way and given them again the use of their legs." He adds:

"I do not wish to assert that an action on the senses can have no direct influence on the muscular force: various physiological experiments seem to show that it may. But I refuse to recognize any so-called 'dynamogenic' action in the facts here detailed.

"Encouragement creates no force: it can only set free pre-existent energies. Rest and food alone can restore to an organ the strength that it lacks, the former enabling the cell to eliminate its toxins and the latter carrying to it nutritive material.

"A psychic excitant acts in another way on the elements of the thinking brain, which are much more delicate and mobile. It dissipates sad humors and what we call fatigue. Finally, just as the conviction of powerlessness makes one powerless, strength may return again with the feeling that one possesses it.

"M. Tissié, in his interesting work on 'Fatigue and Physical Training,' cites several examples of this psychic influence:

"During the bicycle race from Paris to Brest and return, Terront, overcome by sleep after sixty-six hours on the road and three nights without rest, fell by the way. He had no wish to go on, but his brother urged him to do so. He was replaced on his machine, and after moving along hesitatingly for a few minutes he started off in excellent form and won the race in a brilliant finish.

"After his ride of 1,000 kilometers (621 miles), which had lasted forty-two hours, this same rider * * * affirmed that he could do 100 kilometers more, if they would place him again in the saddle.

"Victory does not belong always to the army that can boast of the fewest casualties, but to that which knows how to resist psychically and to advance at the proper moment.

"Examples are numerous: 'A battle lost,' said Suvaroff to Joseph Le Maistre, 'is a battle that is believed to be lost.' 'There are in war,' said Prince Frederick Charles after Rézonville, in 1870, 'other factors besides those of tactics or strategy, namely, those of moral superiority, and there are cases where we should rely on the latter in the face of the former.'

" 'European states,' wrote M. F. Regnault, 'accumulate formidable engines of war; fortresses, cannon, guns—all are of the last degree of perfection. The number of combatants is immense: it is a nation in arms. But is any thought taken for the moral factor? Evidently not. And nevertheless this moral factor is the

whole thing, with millions of people suddenly torn from their firesides and filled with fear. Formidable masses without cohesion—a terrible instrument that no hand knows how to wield. The moral element is the king of battles.'

"Above the muscular act stands a psychic act, conscious and superior."

MARVELOUS RESULTS OF HEREDITY.

Heredity is defined as "the law through which the individual receives from his parents by birth his chief vital forces and tendencies, his physical and spiritual capital."

Environment, the events and conditions that surround him after birth, are governing factors in molding his career and life. "Like produces like." "When the fathers have eaten sour grapes the children's teeth are set on edge." The following seven laws of hereditary descent are now generally accepted:

1. Direct heredity, or the usual laws of heredity, wherein the child resembles its parents.

2. Revisional heredity, or atavism, where the child resembles its grandparents or a remote ancestor.

3. Collateral heredity, where the child resembles an uncle, aunt or some collateral relative.

4. Co-equal heredity, which creates and maintains about an equal number of the sexes.

5. Pre-marital heredity, where a child of a second or third marriage resembles the husband of a previous marriage.

6. Pre-natal heredity, where the conditions and characteristics of the mother before the birth of the child are transmitted.

7. Initial heredity, or the transmission of the temporary mood of the parents to the child.

EXPERIMENT OF EMPEROR.

Heredity is transmitted in face, form and feature, in size and form of body, color of eyes, and hair, voice, manner, in organic qualities, mental, moral, physical, in disease tendencies—in short, physiologically and pathologically. We have all read of Frederick William I and his favorite regiment or bodyguard of giants whom he required to marry women of equal size. Their offsprings were of gigantic size and the descendants are said to be the most superb specimens of physical manhood in Germany today.

Race peculiarities, family and individual characteristics, all are hereditary.

However, there are many exceptions to the general rule that like produces like. Nature plays strange freaks. For generations she seems to have stored up and accumulated vital force, mental and moral energy and at last to have concentrated it all in one fortunate individual, whom we call a genius, but in doing so she frequently exhausts herself, for the offspring of the genius is often a mediocre, or even worse.

All know that longevity is hereditary. The well equipped life insurance companies have reduced their estimates of

man's expectancy almost to an exact science.

HEREDITY AND ANIMALS.

Superior breeds of live stock, horses, cattle and dogs, are not produced by chance or accident, but by the most careful selection and breeding. Human beings have ceased to regard this as a theory, and have come to acknowledge it as a fact, yet how few practice it in producing offsprings.

The best live stock will degenerate into "scrub stock" and fine breeds of dogs into curs if allowed to cross and hybridize promiscuously. Is the rule different with human beings? Natural law undoubtedly tends to elevate the race of men, just as it does the races of the lower animals, but is it fair or just to ourselves, claiming, as we do, to be rational beings and knowing the operation of nature's laws, to shift all the responsibility on natural law? The race of men of the year 2.000 will doubtless be superior to the race of men of the year 1.000, but how infinitely superior the race could have become, even in this comparatively short period, had it aided nature's laws and bestowed on itself only the care it has upon the breeding of horses.

How can we breed sound stock—sound mentally, morally and physically? What combinations can we form to eliminate certain undesirable traits, liabilities and tendencies and render us immune from disease? Health is the normal and disease is the abnormal condition. Nature will sift and restore, in a measure, the ills and disorders of the flesh, but human agencies can greatly aid nature.

NEW FIELD FOR SCIENCE.

The chemist studies to produce certain results from certain combinations. Why does not medical science tell us how to obtain the best results by crossing certain family traits and characteristics and how to eliminate disease and constitutional disorder by similar methods?

What future searcher after truth will discover the panacea of perfect physical, mental and moral manhood? Who will endow a school for the systematic investigation of the laws governing heredity? Our philanthropists seem more disposed to endow sanitariums and hospitals for the care and attempted cure of diseased creatures after they are thus monstrously and wilfully produced. Why not teach and require the sound and pure and virtuous to seek one another; thus leaving the unsound and vicious and degraded to seek their kind? Extinction awaits the latter all the sooner. Diseased organisms will die eventually unless crossed with sound stock and supplied with fresh blood. What scientists will teach us the avenue of escape from this ancestral heritage of woe? How can we separate the chaff from the wheat in our composition and winnow it away? How can we drain off the poisonous pollutions from the blood? A person whose brain is affected with the disease known as insanity is prohibited by law from entering into a marriage contract and propagating his kind. Why not prevent persons afflicted with other malignant diseases, such as consumption, paralysis, cancer, the loathsome diseases and nervous disorders productive of insanity, from entering into marriage contracts and in-

creasing human burdens and endangering human life and health?

Other forms of disease as well as insanity are dangerous to society and the state. Why not suppress and prevent them? Why not strike at the primary cause by enacting and enforcing rigid laws, as in case of contagious diseases and consanguinity, and thus eradicate the evils of disease and substantially stamp it out, root and branch?

FORMULA OF HEREDITY.

If there is a science of heredity, why not master it? If it can be expressed in mathematical formula, let us familiarize ourselves with its equation. Let X, the first member of the equation, represent the individual. Let the total heritage from all his ancestors represent the second member of the equation, thus, X equals 2 parents, plus 4 grandparents, plus 8 great-grandparents, etc. Thus considered, the two parents contribute ½, the four grandparents ¼, the eight great-grandparents ⅛, etc., of the total heritage of the offspring.

Or, in other words, each parent contributes ¼, each grandparent 1-16, each great-grandparent 1-64, etc. Is one's composition numerically determinable? Some writers on heredity believe so, and have in a measure adopted the foregoing method of numerical representation. Who knows but in future the responsibility of the criminal may be fixed by mathematical rule? For instance a thief, the son of a thieving father, is ¼ a natural thief, whereas a thief the descendant of one thieving grandparent is only 1-16 a thief. To overcome the thieving in the first instance requires four times as much resistance as in the latter. In the first case the proportions are ¾ honest heritage versus ¼ thief, whereas in the latter they are 15-16 honest heritage versus 1-16 thief. Hence justice and equity would demand that the punishment in the latter case be four times more severe than in the former. We often hear the expression, "Let the punishment fit the crime." Here, then, is a rule that enables us to mete out a sentence commensurate with the guilt.

In R. L. Dugdale's book, entitled "The Jukes," the descendants of one neglected, wayward, vicious girl are traced through several generations with the following results:

"During six generations 62.40 per cent of the female descendants were vicious and abandoned. Among the women there were seven and one-half times more paupers than among the average women of the state, and nine times more among the male descendants. Among 700 cases 280 were pauperized adults and the investigation extended to only one-third of the family. Of these 700 only twenty-two had acquired property and eight had lost it, seventy-six were convicted of crimes and punished, and more than double that number were thought to be criminals."

PAST DIRECTING PRESENT.

All this proves how necessary it is for each one to study his ancestry and buckle on his armor in the struggle against possible hereditary vices. The past is largely directing the present. Life's coloring is borrowed from the pigments and reflected from the canvas of bygone ages. Give me sufficient data wherewith to analyze the characters of an individual's ancestors

for four generations back and I will tell you who and what he is or is capable of being.

Let me paint you a picture. You are the apex of an inverted pyramid. You bear upon either shoulder an ancestor. These in turn bear upon their shoulders two other more remote ancestors and so ad infinitum. The processes of heredity are found to be wonderfully balanced and their equilibrium stable. Individuals differ, but the general result is uniform. The man at the apex is burdened with the weight of generations of ancestral heritage and he cannot get from under. He is the resultant of two forces, two immediate components, which in their turn are the respective resultants of other forces more remotely removed. He is the mean between these two components and yet a variable mean. No child is exactly like either parent. Where does the child get traits possessed by neither? Manifestly they are handed down direct from some long-armed remote ancestor far up in this metaphorical pyramid. In holy writ we read that "the sins of the fathers shall be visited upon the children unto the third and fourth generation." And we can readily imagine some sinewy armed, hoary headed old ancestral sinner equipped with a long blacksnake whip, provided with a keen scorpion-tipped lash, viciously scourging the bare back of his unfortunate descendant who is compelled to stand Atlas-like at the apex of this inverted pyramid and bear the ancestral burden.

There is an ancient Greek legend that pictures the malignant furies pursuing families from generation to generation and rendering them desolate and wretched. The furies of the Greeks are the vices and hereditary diseases of today.

IS CRIME A DISEASE?

Dr. Edward Wallace Lee, who was one of the physicians in attendance upon President McKinley at his death, has devoted much attention to the subject of crime and its causes.

"I believe," says Dr. Lee, "that the community in general is too much inclined to treat crime as our ancestors used to treat insanity. In those days an insane person was thought to be bewitched, possessed of a devil, and the manner of treatment was cruel in the extreme. Flagellation and whipping were resorted to in order to drive out the evil spirit.

"As the subject was studied scientifically, however, it became evident that insanity was a disease and it was cared for properly, and often cured, without resort to dungeons and chains, various forms of barbarism and often death to the victim. Mind may be defined physiologically as a general term denoting the sum total of those functions of the brain which are known as thought, feeling and will. By disorder of mind is meant disorder of those functions.

"From that standpoint we argue that with an anatomically defective brain you cannot get a normal mentality. Furthermore, the brain is affected by disease or injury not only to itself, but to remote parts of the body which are connected with it through the nervous system. Only a few years ago the New York Medical

Journal published reports from institutions of the state showing that examinations of criminals serving terms revealed injuries to their brains.

"Photographs were offered clearly proving that these men were of the most pronounced criminal type. Then, after thorough examination and proper diagnosis, surgical operations were performed and other photographs were produced showing that they had been restored to normal physical and moral mentality.

BULLET MADE PREACHER VICIOUS.

"I knew a Baptist minister once," continued Dr. Lee, "who was educated and talented. At times he would deliver the most beautiful and learned sermons, and often before reaching the end he would fly into a passion and use the most obscene and profane language. Then he would go home, indulge in excessive drink, abuse his family and really endanger the lives of all who came in contact with him. These spells would pass and he would again become normal.

"I asked him once why this was so, and he told me that he had a bullet in his heart, received during his service in the civil war. Of course, I did not believe him and repeated examinations by myself and other physicians failed to detect any sign of such a condition. That was before the day of the X-rays.

"One day this man died after a fit of anger. A post-mortem examination was held and a minie ball was found in the muscles of his heart. The whole case was published in detail at the time in the Journal of the American Medical Association.

"I have known of cases where so remote an irritant as an ingrowing toe nail has produced epileptiform fits which would be preceded and followed by a change in the temperament and character of the individual, and which were entirely relieved by surgery. I have known wax in the ear to produce suicidal and homicidal tendencies, and many cases where a buzzing in the ear, caused by catarrh, has resulted in suicide.

"Among the lower classes there is a common condition of microcephalic children—that is, children born with small, hard heads. In some instances, surgery has relieved this by removing portions of the skull and permitting the brain to develop. Many such attempts, however, have been unsuccessful, but is it not better to risk death than to allow the child to grow up into an idiot or a criminal?

"Of course, the whole question resolves itself into that mysterious vital spark of which neither science nor religion has the faintest comprehension. The physical conditions that produce criminals may be traced to heredity in many cases. How are they to be prevented? By stopping the birth of criminals? To make a model man, as some one has said, we must begin on his great-grandfather; or, as somebody else has put it, it takes three generations to make a gentleman.

EDUCATION NOT A PANACEA.

"The celebrated Dr. Maudsley says that so much in human development being due to education, it is evident that the training which a person undergoes must have a great influence on the growth of his intellect and the formation of his char-

acter. What he shall be and what he shall do will be determined in great measure by what has been done to bring into full activity the capabilities of his nature.

"But great as is the power of education, it is yet a clearly limited power—limited by the capacity of the individual nature—and can only work within this larger or smaller circle of necessity.

"Education can plainly act only, first, within the conditions imposed by the species, and secondly within the conditions imposed by the individual organizations; cannot, for example, ever teach a man to fly like a bird, see like an eagle, or run like an antelope; cannot make a Socrates or a Shakespeare of every being born into the world.

"Not until comparatively lately has much attention been given to the way in which criminals are produced. It was with them much as it was at one time with lunatics: to say of the former that they were wicked and of the latter that they were mad was thought to render any further explanation unnecessary and any further inquiry superfluous. It is certain, however, that lunatics and criminals are as much manufactured articles as are steam engines and calico printing presses, only the processes of the organic manufactory are so complex that we are not able to follow them.

"All persons who have made criminals their study recognize a distinct criminal class of beings who herd together in our large cities in a thieves' quarter, giving themselves up to intemperance, rioting in debauchery, without regard to marriage ties or the bars of consanguinity and propagating a criminal population of degenerate beings. It is furthermore a matter of observation that this criminal class constitutes a degenerate or morbid variety of mankind marked by peculiar low physical and mental characteristics.

ARE EASILY DISTINGUISHED.

"They are, it has been said, as distinctly marked off from the honest and well bred operatives as 'black-faced sheep' are from other breeds, so that an experienced detective or prison official could pick them out from any promiscuous assembly at church or market. Their family likeness betrays them as fellows. They are often deformed, with ill-shaped, angular heads; stupid, sullen, sluggish, deficient in vital energy and sometimes afflicted with epilepsy.

"Crime is a sort of outlet in which their unsound tendencies are discharged. They would go mad if they were not criminals, and they do not go mad because they are criminals.

"To return to the question of surgery, however," continued Dr. Lee; "it is a fact that the vicious habits of children, due to physical defects, may be and have been relieved by surgical operations, whereas if these had not been performed they would have, as has been clearly shown, drifted into lives of depredation, caused by weakened will power.

"Of course, the little bit of skull pressing down upon the brain may produce various effects in various men, although it is almost invariably a form of disease. Generally, it develops criminals, but sometimes it brings forth geniuses. Napoleon, one of the world's greatest men, was an epileptic; hence his eccentricity. Dr. Johnson was a victim of scrofula, and

hence his melancholy. There are countless instances.

"To my mind, the only effective manner in which to prevent crime is to have a system of thorough examination of the criminal classes, so far as they can be discovered; and by this I mean in every way, mentally, physically, chemically and bacteriologically. Surgery and medicine will do the rest.

"No fear of the practical ill consequences to society need deter us from looking on criminals as the unfortunate victims of a vicious or defective organization and a bad education. But what in this age it would seem right that we should do is to get rid of the angry feeling of retaliation which may be at the bottom of any judicial punishment, and of all penal measures that may be inspired by such feeling. Society having manufactured its criminals has scarcely the right, even if it were wise for its own sake, to treat them in an angry spirit of vengeance."

THE STRANGE CASE OF HELEN KELLER.

Helen Adams Keller was born deaf, dumb and blind, June 27, 1880.

This woman's achievement is without parallel in the history of intellectual feats, for never before has a human being, handicapped as Miss Keller is, secured an academic degree. The story of her battle for an education is a story of struggle against and triumph over obstacles whose very enumeration may well cause amazement to the most determined.

EDUCATION IS BEGUN.

It is through sheer pluck that she has secured her knowledge. From infancy she was blind and deaf and dumb, and up to the age of seven she had absolutely no means of communicating with her fellow men. But she had the senses of taste and touch and smell to aid her to knowledge, and in her seventh year a course of instruction was begun.

Before long her mind had quickened to an appreciation of the outside world, and it was not many years until the idea was born in her brain that she wanted an education. Obstacles? There were no obstacles that could not be overcome by the determination she felt in her own soul, this frail girl told herself, and she announced that she intended to go to college.

GOES TO RADCLIFFE.

By the most arduous toil and by intellectual labor almost inconceivable for a person blessed with all faculties, Miss Keller prepared herself for the difficult Harvard entrance examinations, and in June, 1899, passed the preliminaries with entire success. She was aided in the work only by Arthur Gilman of Cambridge, who read the papers to her in the sign manual and tutored her for the entrance requirements. It was found impossible to hit on any way of teaching her experimental physics, but its alternatives, text-book physics and astronomy, were substituted.

The latter she learned by means of a planetarium, upon which she could feel the position of the heavenly bodies. With

mathematics, including geometry and algebra, she had much trouble, for she is by no means clever in these branches, but history, English, French, Latin and Greek were all mastered through hard work.

her answers, Miss Keller did not avail herself of the aid of her old-time teacher and interpreter, Miss Sullivan, who could have spelled the questions to her through the fingers. Instead, the papers were

Helen Keller and her teacher, Miss Sullivan.

WINS CLASSIC HONORS.

The preliminaries safely passed, Miss Keller took the final entrance examinations in 1900 and again passed with flying colors. In order to avoid the least suggestion of assistance while writing given to her in Braille characters, and she wrote the answers on her typewriter. In advanced Latin she passed "with credit" and in advanced Greek "with honor." At last she was in college, doing the work to which she has so long looked forward.

BUSY IN COLLEGE.

How it impressed her she told in a theme published in the Radcliffe Magazine, March, 1901:

"There are disadvantages in going to college, I find," she wrote. "The one I feel most is lack of time. I used to have time to think, to reflect, my mind and I. But in college there is no time to commune. One leaves the dearest pleasures —solitude, books, imagination—outside with the whistling pines and the sunlit, odorous woods. It is impossible, I think, to read four or five different books in different languages and treating of widely different subjects in one day and not lose sight of the very end for which one reads —mental stimulus and enrichment. Just now my mind is so full of heterogeneous matter that I almost despair of ever being able to put it in order."

TAKES REGULAR COURSE.

In her freshman year Miss Keller was promoted from the English 22 class to English 12, a promotion never made except because of extraordinary progress. No special concessions have been made to her and she has obtained her degree absolutely in the regular course. Of the subjects offered by Radcliffe many were shut out from a blind person, while others were impossible for a person both deaf and blind. Miss Keller's work has thus included no work in fine arts, music, drawing, chemistry, botany, zoölogy or geology. The courses she has taken have been in French, German, English composition, Milton, government, economics, history of mediaeval Europe, Shakespeare, Elizabethan literature, English Bible, English literature of the nineteenth century, history of philosophy and Latin.

At lectures Miss Sullivan acted as the ears of Miss Keller. While the instructor talked, her fingers spelled into the pupil's hand what he was saying.

WRITES OUT LECTURES.

In translation courses Miss Keller would follow with one hand the text on the big book in front of her, while into the other Miss Sullivan would spell the instructor's comments. Each day after lectures Miss Keller wrote out on her Braille machine all that she could recollect of what had been said.

One difficulty to be met was the lack of books in the language of the blind. Through the generosity of William Wade, however, many books were made specially for Miss Keller. But in all cases it was not possible to obtain books. In the history courses, for instance, a vast amount of collateral reading was necessary, and an enormous area of ground had to be covered through Miss Sullivan's spelling passages into Miss Keller's hand.

Through all the toilsome days of her college course Helen Keller did not neglect outside interests. In her freshman year she was elected vice-president of her class, and again in her senior year.

AIDED BY CLASSMATES.

Several of her classmates learned to talk with her in the manual language. She walks, rows and rides a bicycle, and is fond of dancing. Her chief pleasures in college, however, have been the conquering of the difficulties confronting her ambition to take the full course as other girls who have all their faculties. She thus referred to her college life recently:

"I have groped my way through college, reaching out in the dark pathway for wisdom, for friendship, and for work. I have found much work, abundant friendship and a little wisdom, and I ask for no other blessedness."

On June 28, 1904, the day after her twenty-fourth birthday, she was graduated, receiving the degree of Bachelor of Arts from Radcliffe College, with the further distinction of "cum laude." On her certificate is written in Latin an inscription which testifies that she is especially skilled in all branches of English. Thus ends the educational career of this remarkable young woman, who, though deaf, dumb and blind from the age of eighteen months, has required only two years more than girls with all their faculties to complete the same course of study.

At the Louisiana Purchase Exposition, October 18 was set apart as a special day in her honor. An enormous concourse of visitors was present to hear her.

WHAT THE BLIND GIRL SAID.

In the course of her address Helen Keller said:

"I have been asked to come here today and lend my voice to what is being done in the world for the uplifting of those who struggle in unequal and untoward circumstances. All these great halls of machinery and art are the achievement of the strength of man when his arm is free and his spirit unbound. In the midst of so much mighty achievement it is gratifying to know that man has not forgotten his weaker brother.

"I have come, not for aught that I have done, but for what has been done to me to raise me to the level of those who see and hear. I testify to what the good and strong have done for deprivation and infirmity. I enter with you into communion of living speech and for the joy of speech I express my heartfelt gratitude that the impediment of dumbness has been removed from my tongue. Such is my brief but earnest message to those who have asked me to come and to those who sit before me.

HER MESSAGE TO THE WORLD.

"Now I say what seems to me to be the message of this exposition to all people: The exposition is a great manifestation of all the forces of enlightenment where man's thousand torches burn together. The value of everything here and of everything everywhere is educational.

"The exposition is what its distinguished founders intended it to be, a world's university. Here the spirit of civilization stands forth illuminating and enlightening those who walk in darkness and silence.

"The service of man to man shines all the brighter through these circumscribed individuals. All these great halls tell me the world is on our side. The forces there displayed hold up my hands and support my weakness. Science, nature and art say to me: 'Thou art deaf and blind, but enter thou, too, into the kingdom of God.'

"God bless the nation that provides education for all her children."

WHY WE PRAY WHEN WE ARE IN TROUBLE.

The undoubted habit of civilized men and women the world over to resort to prayer when in acute distress, no matter what their religion may be, gives evidence of a human instinct which neither argument nor disappointment is able to eradicate. Pursuing this line of reasoning a recent contributor to the London Spectator points out that those who desire to be delivered from some sudden pain or peril do not ask to have words found for them in which they may express themselves, and they do not turn to the Lord's Prayer of the Bible.

Christ suggested to all men to pray every day for the means of livelihood, and His followers, by their own account, prayed for temporal blessings. Our Lord Himself—with the reservation of complete obedience to God's will—prayed fervently that the doom He foresaw might be averted. Again, it is almost impossible to distinguish between spiritual and temporal benefits, so complex is the world we live in. Most men in the present day simply could not pray for what seems to them a miracle. When the doctor tells us that life is extinct we have not the power to pray that that life may return to the body; but who can tell how many calamities may have been avoided by a spiritual suggestion? To deny that instances of answers to prayer have occurred is, in the opinion of the present writer at least, to shut one's eyes to evidence.

"The explanation of the whole matter which commends itself to our mind is this—that prayer is a beneficent force to which our instinct bears witness. That which we so dimly realize, our Lord, with His infinitely greater spiritual sensitiveness, clearly saw—so clearly that He could hardly find words strong enough to express His meaning, or to impress it upon the minds of his followers. He speaks as though those who pray put in motion some force whose working is as certain as that of any law of nature, and He teaches this as part of the Christian faith. But exactly how that law works we do not know, and He did not explain. Why He did not every man must decide for himself in accordance with the dogmatic medium through which he is able to receive the Christian verity."

DIVINE BENEVOLENCE AND HORRIBLE DISASTERS.

CHRISTIAN FAITH IN THE MIDST OF DESTRUCTION.

The circumstances that try our Christian faith and introduce distressing doubts of God's special providence, as of His justice and kindness, are not essentially different from those which task our intelligence and try our hearts in the ordinary course of human affairs. You see the good and the bad, the important and the insignificant, the faithful and the unbelieving, whelmed in a common fate, the victims of a sudden stroke of misfortune, a petty accident, itself without necessity or excuse, and yet so mighty and awful in its instant consequences—doubtless tends to suggest a sense of the reign of chance, the dominion of pitiless, indis-

criminate law of blind force, terribly shocking to filial confidence, to belief in a personal superintendent and direct and punctilious governor of the universe.

The "General Slocum" as she started up the East River at nine o'clock on the morning of June 15, 1904.

General calamities, like general blessings, fall on whole eras, whole cities, whole races, whole neighborhoods, whole families. War, peace, famine, plenty, pestilence, health, make no distinction in favor of individuals when they come to wither or come to bless the seasons and the nations. If you undertake to run any gauge of merit, or even fitness, through the dealing of death, or pestilence, or war, you must know that you will find no satisfaction in your inquiry. It is not the bad who die early, nor is it the good. It is not the worthless, nor is it the exalted whom pestilence smites. They seem impartial and indiscriminate.

Whoever is found on their ground, no matter what his character or claims may be, how insignificant or how important, falls before them. There seems to be neither an eye to merit, nor to what we think importance, in the allotments of external misfortunes.

ALIKE TO THE LOWLY AND THE GREAT.

Lightning just as naturally and pitilessly strikes down a king as his meanest subject; shipwreck visits a vessel freighted with a thousand souls with as little compunction as a pilot boat. Death destroys more infants than old men; nor is there the least apparent discrimination of tenderness shown to human worth.

The good mother is taken from her orphans; the only child from his virtuous parents. The bad often live on to torment their protectors and supporters. The drunkard survives the faithful wife he has beaten into her grave, after having broken her heart. Yet there is no rule even for this.

The good, the deserving, the excellent are often visited with long life, experience, great outward prosperity; are unexpectedly spared in danger.

The only thing that the providence of God would seem determined to impress upon us is the utter folly of attempting to read its counsels or taking any methodical account of its dealings in individual instances. It baffles all our penetration, upsets all our calculations, and denies us the possession of any means of anticipating or of accounting for its modes of action in particular cases.

The "General Slocum" as she lay in Hell Gate less than two hours later. Nearly a thousand women and children were burned or drowned through the burning of this Sunday excursion steamer.

God's natural mode of action would be by miracle, by constant interpolation, or, perpetual and direct exercise at His will, applied to every specific occasion. A Being everywhere present, all-wise, omnipotent, can find no difficulty in such universal directness and immediacy of action! Why, then, is the world in which

we live and the universe we are acquainted with so undeniably not governed by miracle, so obviously not governed by interpositions and special appliances and accommodations on the part of the Deity?

God benevolently puts the seeming restraint of what we call law—that is, a regular method of acting—upon Himself for our sakes: to create a domain of liberty for us to move in: certain opportunities of foresight, calculation, reliance, on which we can depend and which form the only possible basis of a human, rational and moral existence.

UNCHANGING, UNCOMPROMISING LAW.

All the so-called laws of nature are of this character—though in appearance only—self-acting, rigid, uncompromising and maintained in their general, impartial, and therefore often promiscuous and sweeping operation, for the sake of man's education which is found in struggling with and understanding them, using them, avoiding the penalties of their infraction, enjoying the advantages of obedience to them.

Many suffer by the exceptional evils involved in this method adopted for the general good: and not only for the general good, but the good of every individual who belongs to this common humanity. But, being chosen, because it is for the general good, it would be an act of unkindness on the part of the Deity to interrupt its operation when it presses cruelly upon the exceptional cases.

Nor, indeed, would these laws, which are as yet only partially known, ever be discovered in all their benignant tendencies were not the violations of them attended with frightful consequences, which create earnest and profound investigations that carry out and up the human intellect and advance the interests of society. And when I speak of disobedience to those laws, I do not mean only willful and conscious neglect or breakage, but also innocent and unconscious—for we learn from both. When the innocent suffer, as Christ's own case sufficiently illustrates, they suffer from the guilty and are the means of doing immense services for society.

Suppose only the worthless, and the vile, and the ignorant were subject to shipwreck and pestilence—who would care to investigate their causes or to allay their consequences? And this explains another difficulty, which perplexes most, namely, that the general laws of nature operate not only without any allowance for exceptional cases, but quite independently of moral desert.

WHY EVIL EXISTS BY THE SIDE OF GOOD.

It is one of the greatest proofs of God's universal love for the man that He mixes up the good and the bad in a common external fortune and refuses to treat them, so far as outward circumstances are concerned, in separate departments.

He thus rebukes that self-complacency and selfishness which would otherwise corrupt even the better portion of the race. He says to the intelligent, the good, the orderly, the cautious and the wise: "You shall not only suffer the consequences of your own faults, but you shall even be involved in the external consequences of the faults and mistakes and follies of the unwise, the weak, the pre-

cipitate and the wicked, that you may understand that you are members one of another, bound to be, hands and feet, heart and brain, prudence and goodness, not only for yourselves, but for all other men less fortunate than yourselves." There is a special tenderness, wisdom and love in God—nay, a special justice, too—in thus mixing up all conditions, classes, ages and degrees of moral desert in a common calamity today, in a common benefaction tomorrow, that He may bind us together and perfect that fusion and unity which Christ came from heaven to establish and whose recognition involves the present and final happiness of our race.

THE WAGES OF JUSTICE.

But what, you may say, becomes of God's justice, what of moral distinctions, what of a wise discrimination, if God, being actually present and enforcing His own will, can whelm in common misfortunes hundreds of human beings unequal in desert, opposite in character, vastly dissimilar in wants and in responsibilities. "Master, carest Thou not that we perish?"

Why does justice, pity, love permit this gross confounding of good and bad, of innocent and guilty?

But what have justice, pity and love to do in the sphere of what is, for the highest and kindest ends, meant to be brute force, rigid, immoral, unconscious matter? That is a part of creation that God has not made and could not make without defeating its very purpose, otherwise than blind and deaf to all moral distinctions.

Shall a good man expect his teeth not to ache, or only his conscience not to ache? Shall a wise man expect his body to be any stronger, less exposed to injury from heat and cold, than a foolish man, or only his mind to be stronger and less exposed to ignorance and superstition? In short, we must look for moral discriminations, moral equity, moral rewards and penalties in the moral sphere; in the fortunes of the mind and heart and conscience, not in the fortunes of the body and limbs.

CONSEQUENCES OF NEGLECTED DUTY.

So far as we neglect our duty, darken our consciences, harden our hearts, reject our Savior, break our Maker's laws, stain our bodies, abuse our earthly home, squander our time, bury our talents, we are now perishing. The wildest ocean could not quench, the fiercest fire could not burn, as sin now quenches the soul's light, as sin now shrivels the soul's life.

God is, meanwhile, imploring us by his Son, by our own consciences, by His written and by His unwritten Word, not to perish—to clothe ourselves in the adamantine garments of righteousness that cannot burn, when hay and stubble shall turn to ashes; to put on that robe of faith our Lord gave Peter, which shall buoy us up beyond the power of any waves. Behold, Christ no longer asleep in the hinder part of the boat, but here awake, standing behind the thin veil of these elements that are His body and His blood, and saying to the storms of the world: "Peace, be still"; saying, in answer to your prayers: "Master, carest Thou not that we perish?"—"He that believeth in me, though he were dead, yet shall he live; and whosoever liveth and believeth in me shall never die."

Six hundred and forty-one passengers drowned in the sinking of the Scandinavian steamer "Norge" at Rockwell reef, northwest coast of Scotland.

WHY DO WE LAUGH?

There certainly was a time when man or his simian ancestor did not know how to laugh. What caused him first to open his mouth and emit broad guffaws? It seems to be generally agreed among the evolutionists that laughter came rather late in the life of the race as a luxury. It is not so old as the mimic reflexes of fear, anger, surprise or the various defensive movements which were formerly voluntary. No one ever had to laugh as a means of self-preservation or menace. What, then, was the nature of the prehistoric gesture?

M. Vanlair rejects in a general way the theory that man first laughed over his food: that as the mouth, in uncivilized society was—and still is—wide open in the process of eating and as gorging was the chief pleasure in the life of aboriginal man the law of association gradually made the opening of the lips into a symbol of pleasure. The French scientist has a more comprehensive theory to expound. He believes that laughter grew out of the expansivenes of the whole human organism in the relaxation that was made possible when danger was removed. All animals shrink into themselves in times of peril. When the danger is passed the creature "mobilizes its members," to use the psychologist's phrase, just as in civilized society a man "expands" in jovial surroundings or "thaws out" in the sunshine of quiet contentment. That which grew into a laugh might have become a twitching and quivering of the whole body had not the expression fortunately been limited by processes of natural selection to the face. True, a few people still laugh with their feet, but had laughter developed as it began we should laugh all over to such an extent that we should daily run the risk of dying of apoplexy.

The notion that the cat-laugh is the quintessence of humor M. Vanlair rather rejects as fanciful. So, too, he would probably repudiate the grimace with which Superintendent Price's tame fox in the Middlesex fells greets its master—a grimace which the owner feels certain is one of pleasure. The right to hold both one's sides with laughter, according to this French scientist, belongs pre-eminently to mankind.

IMPORTANT INCIDENTAL FACTS.

DO ANIMALS FAINT?

A little gray dog tumbled headlong into the area of a house in a West End square, and the maid who happened to be standing there closed the gate. When the dog saw she was safe from her pursuers—two huge bull terriers—she toppled over in a dead faint. The other servants, who crowded out into the area to help bring the little animal to, derided the assertion, but a veterinary surgeon who finally joined the group said there was nothing preposterous about it.

"Of course she fainted!" he said. "Lots of animals faint. Cats and dogs, and even more stolid animals, keel over in moments of fear and exhaustion. In the case of horses the prostration is generally

attributed to sunstroke, but quite often they are knocked out by a plain, every-day faint instead of atmospherical excesses. Fowls faint, too, and the birds of the air. In fact, it is hard to find any living creature that doesn't topple over under crucial circumstances."

PSYCHOLOGY OF THE MOB.

Regarding the actions of mobs and crowds a writer on psychology says: "A crowd is not an aggregation. It is an individual mind, impulsive and erratic, with its moral or ethical level generally much below that of minds that have lost their individuality in it. The personality of the men in a mob is lost, for it is recognized that back of the avowed causes of human actions are unconscious motives or forces that defy investigation and that these are the mainspring of crowd activity. These motives or forces are the common characteristics of the race, and in these points people are more alike than in the acquired characteristics that come with education.

"These forces are primitive, so that crowds are generally incapable of rising above primitive actions. And it is this that explains in part how otherwise respectable people will assist at lynchings and even at torture. Some of the characteristics of the mob are a sentiment of invincible power, the force of suggestion and contagion. The force of numbers and sense of irresponsibility add to this sense of power. The soldier in battle is braver and stronger—or more cowardly and panic-stricken—than when thinking independently.

"By means of suggestion and contagion the individuals in the crowd are put into a sort of hypnotic state. The power of the subjective mind is seen and the personal will and objective mind disappear for the time being. Hence mobs are impulsive and mobile. They are aroused one minute to acts of generosity and heroism and descend the next to extreme violence and torture. They are credulous, believing things that would be absurd to one outside the sphere of crowd influence."

INTELLECT AND EMOTION.

It is a law of the human mind that the emotions are excited only by an impressionist view of things, and that the analysis of these things destroys the emotional effect and substitutes for it an intellectual excitement. The analysis of any particular object in nature absolutely kills it as a source of poetry, romance or devotion. Where botany begins the poetry of the flowers ends. Where the study of theology as a science begins religious ecstacy ceases. Where the mastery of the theory of music begins the normal enjoyment of music is lost. On the same principle the study of the mechanism of the heavens is fatal to any poetical or devotional inspiration from the starry sky.

This appears at first sight to attach a penalty to science, but, if Lord Bacon's opinion is of any weight, it puts a premium on it, for he remarks on the fact that the pleasures of the intellect far outweigh the pleasures of imagination and emotion. This is explained in the fact that emotions constantly vary in force while intellectual satisfaction is permanent.

THOUGHT THE PRODUCT OF MENTAL CRYSTALLIZATION.

In a clear liquid, charged invisibly with molecules having an affinity for one another, a hazy point of condensation appears. If uninterfered with this point rapidly hardens, other molecules flock to it from all sides, a law of combination manifests itself, the molecules arrange themselves in a definite order, falling into rank by numberless millions, until the eye of the fascinated beholder sees a beautiful crystal, its sides and angles shaped with the perfection of nature, developed as if by magic out of apparent nothingness, or out of disordered chaos.

Crystals fall under certain recognized general forms, each having a great diversity of special developments, although the broad features of every fundamental form are always distinguishable. Thus there are cubic crystals of immense variety, rhombic crystals, equally varied, and so on.

Similarly men's minds fall under certain broad types, admitting of great diverseness in detail, and according to the type of his mind will be the process and the products of a man's thinking. Let the same fundamental idea form in the minds of two men, and let each of them develop it according to the bent of his mind, and how strikingly different the results will be!

One has a poetic and another a philosophic or a scientific intellect. These are general types. Then each individual has his own peculiar mental bias and that forms his individual style, which we can recognize in his writings and in his speech.

Thus each of us is known both by type and by the particular form of his thoughts, which are the crystals of his mind, and it is possible to predict the development of an idea in any chosen mind, as is exemplified not only by the works of poets, novelists and artists, but also by the characteristic methods of men of affairs.

LIGHT AND PROGRESS.

From the smoky rays of the first flaring brand of the cave-dweller, to the electric light, filling the most spacious halls with its glory and making the streets of our cities luminous as the day, the way has been paved with human effort and illumined by human genius.

The pine torch was no doubt coeval with fire in the hands of men. The resinous knot was the first step in artificial illumination. Its use is found in every savage tribe and nation, while it is a necessity in the lives of all first settlers in new countries. When the nineteenth century dawned, the children of America were learning to read by the light of pine knots and the crackling of logs of an open fire-place; so closely are we related to what may seem the remote past.

It is hard to believe that the world groped on to the thirteenth century without discovering even the tallow candle; yet so it is. The expression that "mankind was plunged in darkness during the early ages" is true in every sense. It was perhaps the accidental burning of a bit of fat of some slain animal that suggested its use as a luminant, while the hollow shell from the sea, a concave rock, or a mold of sun-baked clay held the fat, which was burned by placing a rush in the fat, with the lighted end projecting

over the edge of the rude dish. Step by step the lamp was fashioned into a thing of beauty, though barely a joy forever. Thus came the first improvement in the art of domestic illumination.

Not until about 1830 did our fathers have a match to carry in their pocket. Up to that time they must light their pipe with an ember or by the tinder box. Should the fire of the hearth go out he must revive it by steel and flint or make a hurried trip to the neighbor's to secure his fire. At an early hour on a cold morning this was no pastime.

The common kerosene lamp, with its chimney of glass, its varied forms of beauty, its shades modified to every grade of vision and of taste, suggests the relation of man to light. The oil, natural, cheap, brilliant and volatile, was long known to civilized humanity as a crude outflow from the earth. It was not until about 1845 that the iridescent scum seen floating on the surface of a stream near Pittsburg suggested to thoughtful men to dig for a greater supply. Indians came from a distance and soaked it from the water with their blankets which they wrung out into vessels in order to secure a quantity for some secret purpose. When the American found it he was rich beyond computation, at the same time providing at a small cost the best fuel and the cheapest light for the common people. It was not until 1860 that it passed into common use. Since that time it has driven every form of wax, grease, fluid, camphene, and whale-oil lamps from the common use of mankind.

From the clouds overhead, lowering along the horizon as the sun goes down, Franklin and Edison have drawn the electric fire and in our chambers darkness is unknown. All the way from the pine knot to a nightless day has been won from the darkness in a lifetime.

BOOK VII

Remarkable Appearances

AND

Evolutions in Nature

WITH THEIR

RELATION AND SIGNIFICANCE TOWARD THE UTILITIES OF HUMAN LIFE

A VIEW OF MAN'S MASTERY OVER HIS SURROUNDINGS, SHOWING THE MANY STRANGE DEPARTURES FROM COMMON TYPES

Changes of time. British troops enacting the Battle of the Pyramids. They have occupied Egypt since October, 1882, and are now making this ancient country an integral part of the British empire.

REMARKABLE APPEARANCES *and* EVOLUTIONS IN NATURE.

WONDERS OF VEGETATION.

BIG TREES.

THE Mariposa and Calaveras groves of California contain trees above 400 feet high and nearly 100 feet in diameter, whose age is estimated by the best scientific authority to be near five thousand years. Their parents grew in the Miocene period of geological eras. They have no near kinship with any other existing forms of vegetation and stand alone as the sole surviving relics of an ancient world.

As some of the smaller ones have been cut into lumber strange histories are revealed. Marks of great forest fires are recorded on their trunks even back before the time of Christ. Fewer than five hundred of the greater ones now remain. The Mariposa grove is now reserved from destruction through an act of the California legislature making it the property of the state and the Calaveras grove is likewise saved as a National Park.

One of the trees cut down showed by an actual count of the annual rings to be 2,200 years old. Another that had been blown down in a storm had 4,000 of those rings.

Elsewhere in the world, notably in India and the Amazon region, are trees of immense age, but none so venerable as the *Sequoia Gigantea* of California.

The effects of certain tremendous forest fires occurring centuries ago are registered in the trunks of these trees and the record completely concealed by subsequent healthy growth. Among a number of similar cases the most instructive record of these ancient forest fires was observed in a tree of moderate size—about fifteen feet in diameter—five feet from the ground. It was 270 feet in height and 2,171 years old.

This tree when felled had an enormous surface burn on one side, thirty feet in height, and occupying eighteen feet of the circumference of the tree; this was found to have been due to a fire occurring in A. D. 1797. The tree when cut, in 1900, had already occupied itself for 103 years in its efforts to repair this injury, its method being the ingrowing of the new tissue from each margin of the great black wound. When the tree was cut the records of three other fires were revealed. The history of the tree was as follows:

HISTORY OF ONE REDWOOD TREE.

271 B. C. it began its existence.

The first year of the Christian era it was about four feet in diameter above the base.

245 A. D., at 516 years of age, occurred a burning on the trunk three feet

wide. One hundred and five years were occupied in covering this wound with new tissue. For 1,196 years no further injuries were registered.

1441 A. D., at 1,712 years of age, the tree was burned a second time in two long grooves, one and two feet wide, respectively. Each had its own system of repair.

One hundred and thirty-nine years of growth followed, including the time occupied by covering the wounds.

1580 A. D., at 1,851 years of age, occurred another fire, causing a burn on the trunk two feet wide, which took fifty-six years to cover with new tissue.

Two hundred and seventeen years of growth followed this burn.

1797 A. D., when the tree was 2,068 years old, a tremendous fire attacked it, burning the great scar eighteen feet wide.

One hundred and three years, between 1797 and 1900, had enabled the tree to reduce the exposed area of the burn to about fourteen feet in width.

It is to be noted that in each of the three older burns there was a thin cavity occupied by the charcoal of burned surface, but the wounds were finally fully covered and the new tissue above was full, even, continuous, and showed no sign of distortion or of the old wound.

The recuperative power of these trees thus demonstrated has encouraged the forestry doctors to believe they can keep the Grizzly Giant and his aged companions alive for many human generations yet to come.

OLDEST TREES ON EARTH.

The baobab trees of Senegambia are believed to be the oldest trees on earth. Some scientists have put the age of one of these at 6,000 years, and the conscientious Livingstone was positive that one he examined was not less than 1,400 years old. This is the tree that sends out the immense branches that bend to the ground for support, although they grow sometimes to a length of seventy-five feet before they bend. One of these trees with ground-resting branches covers such an area that it is a public hall, its portals being ornamented by quaint, rude sculptures cut out of the living wood.

There is a legend about a tree of Thibet called the "tree of ten thousand images," which runs like this: Far away in the dreary land of Ambo in Thibet is a green valley in which, in a Tartar tent, was born a wonderful boy named Tsong-kaba. From his birth he had a long white beard and flowing hair and could speak perfectly his native tongue.

His manners were majestic and his words were full of wisdom. When he was three years old he resolved to cut off his hair and live a solitary life. So his mother shaved his head and threw his long, flowing locks upon the ground outside their tent door. From his hair sprung the wonderful tree.

Tsong-kaba lived many years, did countless good deeds, and at last died; but the tree which had grown up from his hair lived long, and they called it "the tree of ten thousand images." This was long before the Christian era, but it is the testimony of the French missionaries that the tree lives yet. The leaves are always green; the wood is of a reddish tint and has an aroma as of cinnamon.

The bark of the tree is marked with symbols in the Thibetan language; alpha-

Many trees in the Calaveras and Mariposa groves of California stand from 275 to 335 feet high and are from 25 to 34 feet in diameter.

betic characters also appear in green on every leaf. The branches are described as being spread out like plumes of feathers crowning a trunk only eight feet high, but of great girth. Two French missionaries who saw the tree were convinced that the marks upon it were of natural growth.

WIZARD PLANTS.

Eccentric vegetation is confined to no tropic or zone or country. In Madagascar is to be found a tree known as the "traveler's tree," because of its beneficent quality of providing pure fresh water on demand to the weary and thirsty wayfarer in that far-off land.

This tree has the appearance of a huge fan, with a rather unwieldy handle. The body of the tree rises thirty feet, at which height the leaves radiate from opposite sides of the stem. These leaves are eight feet long and stand on a leaf stalk six feet in length, and there are twenty to twenty-four of these leaves on a single stem, spreading out like an open fan.

In the dry season, when all seems arid and parched, the traveler or domiciled native has to pierce one of these trees at the point where the fanlike crest has its beginning and out will flow pure, fresh water, as cool as if it had been raised in the "old oaken bucket" from the depths of a well.

But its uses as a vegetable fountain are not the only ones it has to commend it to the people of the island. From the leaves are formed the strong, serviceable thatched roofs of the houses for dwellers on the eastern side of the island. The stems of the leaves are used for partitions, and sometimes even for walls of the houses. The outside bark is laid for flooring, and the leaves again, when beaten flat, serve not only for tablecloth, but for the plate from which one may eat when seated before such tablecloth.

COW TREE OF VENEZUELA.

In Venezuela is the vegetable wonder known as the "cow tree." This tree grows on rocks where no other thing thrives. Its leaves are leathery and crisp, but by making incisions in the trunk a peculiar grayish milk oozes out, which is tolerably thick and of an agreeable balmy smell.

The natives gather around these trees at sunrise, bringing large bowls to receive the milk, for toward noonday the heat of the sun changes the milk to sour. However, the milk will harden into a toothsome gum, much as the familiar breaking of the milkweed's stalk by schoolboys will bring the white juice of that weed, which the air turns to gum.

It is a puzzling sight to the stranger to see the trunks of these trees bristling with plugs, as he will see them, for the drawer of the milk from a hole in the tree will plug it up when his needs are supplied, to keep the tree from unnecessary waste.

Three old trees are the "butter tree" of Central Africa, the "manna tree" of Calabria and the "tallow tree" of Malabar. The first bears a nut from the kernel of which the natives produce a butter which African travelers say much resembles butter obtained from cow's milk and will remain sweet a year.

The "manna tree" is so called because from a sap, which is trapped in August, a sweet gum is evaporated which has no

little food value. The "tallow tree" of Malabar yields from the seeds of its fruit, by boiling, an excellent tallow, which serves as an illuminant, both as oil and by candle made from it.

A remarkable tree flourishes on the island of Fierro, one of the larger of the Canary group. The island is so dry that not even a rivulet is to be found, and for that absence of water a curious compensation is made. The leaves of this tree are long and narrow, and they continue green the year through. The mystery of this tree is a cloud that hovers about it constantly; this is condensed to water, which saturates the leaves, and falling from them in drops, keeps the cisterns, which are in excavations beneath them, always full of water. It is the absence of water, save this so strangely collected by the rain tree, that keeps the island sparsely populated; for the trees are few, and the supply of water is not sufficient for a larger population.

SOAP TREE OF FLORIDA.

In this country are two strange creations among trees—the "soap tree," which grows in Florida, although it is not indigenous, and the "witch tree." The latter is more properly, perhaps, a brush or shrub, and is peculiar to the Tuscarora gulches in Nevada.

The "soap tree" was brought from Japan, where it is common. It is a prolific bearer of berries about the size of a cherry, and of the yellow color of a bar of soap. From these berries, boiled with the hard black seed they contain, a good soap is made. In Japan the berries are used as a substitute for soap just as they come from the trees.

The "witch tree" is a dwarf tree, its stem rarely as large around as a man's arm, and seldom taller than eight feet. It has innumerable branches and intertwining twigs. Its foliage is so luminous that at night it can be distinguished a mile or more away, and in close proximity to one of these trees fine print is easily read.

This tree is evidently a species of bay, and the luminous property of its leaves is parasitic. It consists of a gummy substance, which, upon being transferred to the hand by the rubbing of leaves upon it, imparts the same phosphorescent glow, while the glow disappears from the leaves.

A unique tree on the Island of Goa, near Bombay, is the "sorrowful tree," as the natives term it. That name is given to it because the tree has a drooping appearance during the daytime. But its aspect changes as the sun goes down; then its leaves open and fragrant blossoms come into bloom upon it. The moment the sun shows itself in the east the blooms close, the leaves begin to droop and the petals of the blossoms fall to the ground.

WHISTLING TREES.

Among the curiosities of tree life is the sofar, or whistling tree, of Nubia. When the winds blow over this tree it gives out flute-like sounds, playing away to the wilderness for hours at a time strange, weird melodies.

It is the spirits of the dead singing among the branches, the natives say; but the scientific white man says that the sounds are due to a myriad of small holes which an insect bores in the spines of the branches.

The weeping tree of the Canary Islands is another arboreal freak. This tree, in the dryest weather, will rain down showers from its leaves, and the natives gather up the water from the pool formed at the foot of the trunk and find it pure and fresh.

The tree exudes the water from innumerable pores situated at the base of the leaves.

In Japan they have a tree called the smoking tree. It is a small tree and has little to attract attention were it not for the fact that most of the time a little cloud, apparently of smoke, hangs over it a few feet above the topmost branches. It looks exactly as if the trunk of the tree were a smoking chimney.

The phenomenon is caused by an emanation which the tree gives out under the effects of sunlight.

In Ceylon grows a tree called "Eve's Apple Tree." It is the fruit of this tree which makes it remarkable. It is a beautiful fruit to look at, deep red on the inside and orange on the outside, and out of each fruit a piece appears to have been bitten.

The simulation of a fruit which has recently been bitten into is perfect. You can see the very marks of the teeth and anyone not knowing the facts would be deceived.

For this reason, and because the fruit is a deadly poison, the natives declare that the tree is that which grew in the Garden of Eden, and was called the tree of the Knowledge of Good and Evil.

NATURAL THREAD AND NEEDLE.

The wonders of botany are apparently inexhaustible. One of the most remarkable specimens is the Mexican maguey tree, which furnishes a needle and thread all ready for use. At the tip of each dark green leaf is a slender thorn needle that must be carefully drawn from its sheath; at the same time it slowly unwinds the thread—a strong, smooth fibre attached to the needle and capable of being drawn out to a great length.

COW-ITCH OF AFRICA.

"There is no vicious growth in Africa or the world," writes a traveler, "to compare with the detestable thing popularly called 'cow-itch' and known to botanists as the mucuna bean. This is a plant having small seed pods covered with a close array of fine, silky hairs, which, when shaken loose, fasten in myriads upon the unconscious wayfarer and, reaching all parts of the skin, set up an irritation which words are literally powerless to describe. A man attacked by this abominable pest gives way for the time to absolute frenzy. If a precipice were at hand he might almost be forgiven for jumping over it, so wholly unendurable is that burning, pricking, clinging itch."

THE CAUSE AND USE OF THORNS.

The influence of the environment is very great in the formation of thorns, so great in fact that we frequently find that a plant in one place has thorns and a few miles away is devoid of them. Observation and experiment are in agreement in showing that three causes are in operation here, namely, impoverished soil, dryness of the atmosphere, and intensity of light, each of which provokes or accentuates the condition under discussion. In this

connection it is interesting to state that cultivation diminishes the number of spines and in many instances makes them disappear after several generations.

M. Lhotelier has shown by a long series of experiments that thorny plants when submitted to the action of humidity tend to lose their spines, the reduction taking place in two ways. In the case of spines which are produced by modified leaves or modified stems, there is a tendency to revert to the primitive type, while in those which originate in stipules—an organ unnecessary to the life of the plant—the spine diminishes and in many cases completely disappears. The partial deprivation of light also produces a more or less complete suppression of the thorns, as proved by many authenticated instances.

HOW DO THEY BENEFIT THE PLANT?

It thus appears that thorns are the result of insufficient nutrition, but this answer by no means exhausts the subject, for the question arises, what is the use of the thorns, and how do they benefit the plant? Grindon claimed that the thorns have no use since they are found in a large number of families different both as to form and as to needs, but there can be but little doubt that the thorn is a means of protection to the plant and that its purpose is to inspire a healthy respect in quadrupeds. The thorn protects the creatures which carry it, and whether the case be that of a hedgehog or thistle, beast or bird, it allows its possessor to the more effectually defend itself.

Thorns of eglantine, sloe-tree and gooseberry.

A GREAT DISHRAG FARM.

A novel enterprise, that of raising dishrags, is being exploited by a number of southern California horticulturists, who received the inspiration for the scheme from Charles Richardson, whose gardens in Pasadena are becoming famous for their remarkable productions. Mr. Richardson has successfully raised many growths new to American soil, and in 1904 exceeded all his previous triumphs by raising thousands of dishrags. In 1903 Mr. Richardson's string beans, which measured forty-three inches in length, created a stir, but dishrag vines, which, with their pendant dishrags, twine about orange trees, palms, evergreens and peach trees and peek in at the second story windows, bid fair to win the championship from the beans. These dishrags, or vegetable sponges, as they are sometimes called, are indigenous to Africa, but now that it has been demonstrated that they will thrive in this country, they are bound to become a popular production. The seed looks like a cucumber, but when ripe the shell is broken and a sponge disclosed.

DEPTH OF ROOTS.

The depth to which roots extend below the surface of the ground depends greatly upon the condition of the soil. In places where water stands continually only a short distance below the surface they penetrate only to a moderate depth, the roots of the largest trees going down only from six to ten feet.

On high land, in sandy soil, however, the roots of many trees extend to a depth of from twenty-five to fifty feet or more below the surface, and palm roots, including those of the Florida saw and cabbage palmetto, often reach immense depths. Saw palmetto roots were dug from a well in Eustis, Fla., some time ago at a depth of eighty feet, and they have been known to go down to the depth of a hundred feet in some of the Florida sand hills. In drilling a well recently at Winter Park, Fla., a root, or other part of a tree, was struck by the drill at a depth of seventy-four feet below the surface. The wood seemed to be a root of a saw palmetto. And in drilling a well near Sanford, Fla., the drill went through the trunk of a bay tree sixty-three feet below the surface.

AVERSIONS OF ANIMALS.

Not only is it true that animals, both domestic and wild, show decided preferences for certain persons, and a strong dislike to other individuals, but whole races of creatures often show a universal hatred toward other species.

Perhaps the most interesting cases of dislikes are those which are inherited, fear of the natural enemies of a certain weaker species being so strong that even the young just born may experience it. All herds of cattle hate dogs instinctively. Can we not trace this to the time, long centuries ago, when the wild herds were always in danger of being attacked by wild dogs or wolves, which slunk about on the outskirts of the herd, and watched with hungry eyes every chance to cut out and pull down a helpless calf?

To fight like "cats and dogs" has become a proverb, and we must admit that there is abundant basis for its truth. In

domestic cats this is doubtless an inherited instinct, which in one of its larger relatives we can verify today. In India the tiger is king, almost. Deep in the jungles the tigress makes her lair, and the cubs have few enemies indeed. Bear or tiger-cat, when they inadvertently come across the lair trail of the great striped one, back-trail, and rapidly, too. It is doubtful if even the great python would disturb one of the little furry kittens. But the packs of wild dogs are without fear, and would kill and eat the cubs and defy the parent when she returned. Well she knows this, and also that, although she might slay a dozen, yet the others would pin her down, careless if they died or no. So a tiger in captivity will scrutinize a wolf without much show of anger, but pity the dog which ever comes within reach, and if she cannot get at him, her wrath of memory will vent itself in howls and fierce endeavors on the bars of her cage.

A leopard, which lives so much among the trees and could so easily escape the attacks of wild dogs, has no instinctive hate, although a dog is a tidbit which would be by no means despised. This fact is well known to dogs, which show their fear of these arboreal felines, while they will mob tigers and other terrestrial cats. Pumas come under the same head as leopards, and are held in as great respect by dogs.

PECULIAR ANTIPATHIES.

In zoos the animals generally show a dislike to children and cripples; in the first instance, doubtless, because they are teased by the youngsters, and in the second place because of the strange horror and hate which many animals show of the abnormal or conditions out of the usual, for discriminating between which they have remarkable ability.

Monkeys hate negroes, but this dislike of dark-skinned men is not confined to the above-mentioned class of animals. It is said that when Mr. Hagenbeck's Somalis were at the Crystal Palace, London, they were invited one Sunday to see the zoo. There was nothing to which the most sensitive European could object to in the appearance of these free, half-Arab tribesmen, but when the dark men entered the lion house there was an uproar. The animals were furious; they roared with rage. The apes and monkeys were frightened and angry, the antelopes were alarmed, and even the phlegmatic wild cattle were excited. They recognized their natural enemies, the dark-skinned men who had hunted them for centuries in the jungles and the bush, and with whom their own parents did battle when they were captured and carried off captive in the Nubian deserts.

Animals, such as cats, dogs, birds, and even bees, seem to know what persons are in sympathy with them. Some persons will be attacked even by pigeons and doves, and it is impossible for some to have anything to do with horses and other animals.

ANIMALS THAT WILL NOT DRINK.

Naturalists have discovered many animals which seem to need no water or which drink only at rare intervals. There is a certain breed of gazelles which never drink, and the llamas of Patagonia live for years without taking water. There is

a particular class of cattle near Losere, in France, that rarely touches water, but in spite of this fact these cattle give milk of a rich quality, from which excellent cheese is made. Many naturalists have the theory that hares do not drink or that water is not a necessity for them and that

To some the bath is a pleasure, and to others mainly a duty; while there are many instances in which, though the creature has no clothes to wash, the business of cleaning, drying and "ironing" the fur or feathers is a long and tiresome one, though never neglected.

The pertified forests of America are regarded by geologists as one of the wonders of the world. Our photograph shows a number of these giants in the great Arizonian petrified forest. It covers an area of nearly 100 square miles, and within its bounds trees which ages have turned into stone are scattered about in wild profusion.

the dew on the grass is sufficient for their needs.

ANIMALS THAT BATHE.

Animals, many of them, are extremely particular as to bathing at frequent intervals.

In countries under the equator, where the temperature and weather are almost uniform day by day, it is probable that the washing hour is almost as fixed as the drinking hours are.

It is rather curious that birds are far

more devoted to bathing than are beasts. From the falcon to the sparrow, birds delight in bathing; yet they have far more trouble to get their feathers dry than beasts have to dry their fur.

Monkeys never wash or bathe, though they have, as a rule, every chance to do so. Possibly experience has taught them to be afraid of crocodiles, which are pretty generally distributed on monkey-haunted rivers.

It is said, however, that a number of Indian monkeys watched a party of Europeans in a boat, who washed their hands and brushed their teeth. Next day the monkeys were seen to travel to the riverside and go through the form of washing their hands and of brushing their teeth.

Of the cat tribe, large and small, only the tiger and jaguar, and perhaps the little "fishing" cat bathe for pleasure. The tiger will sit with only its head out of the water on a blazing hot day in an Indian jungle.

That the polar bear enjoys a bath *per se* as well as the use of the element for swimming and as a hunting ground no one can doubt.

Though foxes are never seen to wash, and there is no record of the wolf doing so, nearly all dogs bathe, and some do so not only for coolness, but for cleanliness.

Both the elephant and the rhinoceros take great delight in their daily ablutions.

THE SWIMMING OF ANIMALS.

Almost every one knows that a puppy or a kitten cast into water can swim without any previous experience.

Almost all animals know how to swim without having to learn it. As soon as they fall into the water, or are driven into it, they instinctively make the proper motions, and not only manage to keep afloat, but propel themselves without trouble.

Exceptions are the monkey, the camel, the giraffe, and the llama, which cannot swim without assistance. Camels and llamas have to be helped across water, and giraffes and monkeys drown if they enter it. Now and then both of the latter species manage to cross waterways when they are driven to extremities, just as human beings occasionally can keep themselves above water through sheer fright.

A funny, though able, swimmer is the rabbit. He submerges his body, with the exception of head and tail. The latter sticks away up into the air, and his hind legs make "soapsuds" as he churns the water madly to get away. But with all his awkwardness he is a swift swimmer, and among the land animals is beaten only by the squirrel. The squirrel swims with his heavy tail sunk way down in the water, and his head held high. He cleaves the waves like a duck, and a man in a rowboat has all he can do to keep abreast of the swimming squirrel.

One thing which none of the land-living animals does is to dive. No matter how hard pressed a swimming deer, rabbit, squirrel, or other purely terrestrial animal may be, it will remain above water. But the muskrat, beaver, ice-bear, and otter dive immediately.

THE POISONOUS PYTHON.

The young of the poisonous species—deserted from the very first by the parent snakes—are as dangerous as if full grown

from the moment they enter the world. The proprietor of a Philadelphia museum learned this to his cost not long ago. In a big glass case partitioned through the middle by a wire screen there lived side by side an eleven-foot anaconda (of the constrictor family) and a colony of cotton mouth moccasins. It was impossible for the moccasins to glide through the narrow meshes of the screen or even to venture an occasional "strike" at their large and peaceful neighbor. But during the night a brood of young cotton mouths unexpectedly appeared, babies, not five inches long. They squirmed through the meshes of the partition, and before they had been two hours in this world, were gliding joyfully over the lifeless body of the huge constrictor who lay poisoned by the youngsters' fangs.

Regal python. "A creature in length the height of a two-story house; girth measure bigger than a large man's thigh; possessing within its tremendous frame the strength of twelve men; of a brown and purple colored skin; with a head as big as a wolf's; eyes like russet shoe buttons; and a pair of jaws capable of swallowing a full-sized Newfoundland dog."

FANCY MICE AND RATS.

No animal appears to be too small or too insignificant to be made a pet of. It is not to be wondered at, therefore, that mice and rats, with which we are often too familiar when in a wild state, should have had friendly hands laid upon them, and that the caprice of the fancier should have completely altered their appearance. Scientific selection and mating has produced black, chocolate, blue, white, cream, and tortoiseshell mice, and also most elaborately variegated and marked varieties of those colors. They are, in fact, so utterly unlike the ordinary house mice that the latter, when they have the opportunity, do their best to ill-treat and murder their cultured relatives.

WALTZING MICE.

But the fancy mouse, with his wonderful colors and markings, is a very ordinary creature compared with the Japanese Waltzing Mice, which are procurable in this country. The contortions and gyrations of these small creatures are decidedly unique. How they ever took it into their heads to progress by a series of revolving motions is at present a mystery.

Neither is it certain that they originated in Japan. The mice sometimes perform in pairs. This they do by waltzing head to tail, turning so quickly that it is difficult to tell where one begins and the other ends.

Waltzing mice are not quite so long as the common gray mouse, and much more slender. They are spotted black and white at each end of their bodies, and and clear white in the middle. They whirl around on their four feet as if on a pivot; sometimes stopping and reversing the direction. Frequently two or three of them go around together in a large circle. Although they waltz sometimes as long as five minutes without rest, they appear never to get dizzy. They can, if they choose, run in a straight line, but they seldom do. Instead of running away when disturbed or frightened, they begin to waltz. They come out of their nests about sundown and waltz until nearly midnight. Then they go back to their nests to sleep.

One of the curious things about them is their fighting. They waltz until they run into each other, when they bite, squeal, jump into the air—and then start waltzing again. They keep this up until they are seriously injured, sometimes having their tails and legs bitten off and their skins torn.

There are several theories as to the reason they can whirl around in this way and yet not get dizzy. One is that it is because of a disease of the brain that they inherit.

The faculty of waltzing seems to be hereditary, for the young ones evince a tendency to spin as soon as they are old enough to leave the nest. These mice are usually very tame, and can be taken out of the cage and placed on the table, where they will go through their performance. They can be recommended as most comical and inexpensive pets.

In breeding fancy mice, shape and size, as well as color, are important. Large ears and eyes are required, also long muzzles and tails, the latter free from all knots and irregularities. The colors in all the varieties must be rich and deep. The evenly-marked have clear and distinct patches or spots along the body corresponding on each side. There is a National Mouse Club, which looks after the interests of mouse fanciers, and a number of mouse shows are held during the year. Mouse culture can be carried on at slight expense, and in a very small space.

Rats have not as yet been taken up by the fancier to such an extent as mice, though there are white rats, black and white, fawn and white, and brown and white; various other markings are said to be in process of construction. This should be easy, for rats are so hardy and so prolific that they could readily be bred in all the colors and shades of fancy mice. Destructive and fierce as are wild rats, those schoolboys and other people who keep white and piebald specimens, find them tame, harmless, and intelligent, readily learning all sorts of tricks.

Fancy mice are no trouble to feed. Oats, canary, and other bird seed form the staple food, together with bread and milk when there are young ones. The best general food for tame rats is grain, such as wheat, barley and oats. A small pot of cold water should stand in the cage. Both mice and rats must be kept very clean or the cage will become offensive.

FLOWERS AND FLOWER-LIKE INSECTS AND ANIMALS THAT LIVE ON FLESH.

Probably in some respects the most surprising results of late entomological exploration is the discovery of semblances of orchidaceous flowers endowed with animal life and a voracious, carnivorous appetite, that seize and incontinently devour insect vegetarians which, allured by their form and color, incautiously alight upon them.

These flower insects belong to the curious family Manitidae, of which we have a well-known member of our southern states, Phasmomantis carolina, commonly called "praying mantis."

The mantis is really a four-legged insect, for the fore limbs are so modified that they cannot under any circumstances be used in walking, and are no more properly termed legs than would be the arms of men or the wings of birds. They are, in fact, the natural weapons of the insect, and are used for nothing else than fighting and for capturing prey.

INSECT MASQUERADE.

An insect discovered by Wood Mason masquerades sometimes as a pink and at others as a white orchid. The whole flower insect is either conspicuously white or of a resplendent pink color, and both in color and form perfectly imitates a flower. The lower or apparently anterior petal of an orchidaceous blossom, the labellum, often of a very curious shape, is represented by the abdomen of the insect, while the parts which might be taken, regarding it as an insect, for its wings, are actually the femurs of the two pairs of posterior limbs, so greatly expanded, flattened and shaped in such manner as to represent the remaining petals of the flower.

As the mantis rests, head downward, amid the stems and leaves of a plant, the forelegs drawn in so that they cannot be seen, the thighs of the two hind ones radiating out on each side, and the thorax and the abdomen raised at right angles to each other, the insect might easily at first sight deceive more discriminating entomologists than the honey suckers that settle upon it.

An allied species, exactly resembling a pink orchid, is mentioned by Dr. Wallace, on the authority of Sir Charles Dilke, as inhabiting Java. Its specialty is alluring and capturing butterflies. The expected guest having arrived, the seeming feast spread out for his delectation arises and devours him.

Professor S. Kurz, while at Pagu, in lower Burmah, saw what he supposed to be an orchid, of a species unfamiliar to him, but upon examination found it to be a mantis, of the genous gongylus. As is common with the habit of its kind when alighted upon a plant, it hung head downward, exposing the under surface to view, sometimes motionless and sometimes swaying gently like a flower touched by gentle zephyrs. A bright violet-blue dilation of the thorax, in front of which its forelegs, banded violet and black, extended like petals, simulated the corolla of a papilionaceous flower so perfectly as to deceive the eyes of a practiced botanist.

ANIMAL DECEPTIONS.

Brazillian birds, fly catchers, display a brilliantly colored crest easily mistaken for a flower cup. Insects, attracted by what appears to be a freshly opened blossom, furnish the birds with food. An Asiatic lizard is entirely colored like the surface of the desert plains where it lives, except at each angle of the mouth blooms a brilliant red folding of the flesh, exactly resembling a little flower that grows in the sand. Insects lured by the seeming flower are incontinently disillusioned when they settle upon it.

IMPROVING UPON NATURE FOR THE BENEFIT AND PLEASURE OF MAN.

Luther Burbank, who owns an extensive estate near Santa Rosa, has grown plums and prunes without stones, pure white "blackberries" and daises four inches across.

The whole thing is more or less a family affair—a marriage between different individuals in the world of fruit and flowers. The so-called plumcot is a result of a happy union between father apricot and mother plum. Those who know the delicious apricot and plum need not be told how much the two look alike, but how differently they taste. The plumcot is, therefore, a distinctive fruit—"as distinct," says its creator, "as if a new fruit had been handed down from another planet." It has the form of an apricot and the same outside appearance, but is more highly colored than a plum or an apricot, with a soft skin and a shadowy bloom. It possesses a delicious flavor.

In the gardens near Santa Rosa there are today growing many of these plumcots, with varying degrees of plum and apricot flavor blended.

In turning out the white blackberry Mr. Burbank is said to have applied the Darwinian hypothesis inversely. He kept on selecting berries which in ripening did not become pure black, and finally obtained a bush in which the fruit changed from the green immaturity to pure white. This involved the examination of twenty-five thousand bushes several times in several years.

His Shasta daisy, which was first exhibited in the window of a San Francisco florist, and attracted attention from crowds of persons, is a combination of the free flowering American daisy with European and Japanese species, and is the result of eight years' work in hybridization. The merit of this flower which will particularly appeal to those of a gardening hobby is its hardiness. It grows and blooms wherever the oak lives, it is perennial and has a large blossom of a dazzling whiteness, borne on a long, stiff stem that makes the flower valuable for cutting. As each bloom may attain a diameter of four inches the effect produced by thousands may be easily imagined.

AN IMPORTANT BUSINESS.

This making of new flowers, vegetables and fruits is an important business. Thirty thousand dollars was paid some years ago for a new carnation, and the value of some of the new hybrid fruits is, of course, higher, from the standpoint of utility.

Of late years much of the best work in fruit and vegetables in this country has been done by the Bureau of Plant Industry in the Department of Agriculture at Washington, the laboratory of plant breeding under the charge of Doctor Herbert J. Webber having produced many novelties.

Among the successes may be mentioned a cross between the tangerine and the ordinary grape fruit. This offspring is about the size of an ordinary orange, has a skin that can easily be removed and flesh that falls apart as readily as that of the tangerine, with a modified flavor of the grape fruit. To this new variety the experimenters have given the name "tangelo," from "tangerine" and "pomello," the latter being the true name of the grape fruit.

Another success is a new orange which grows in a northern climate, yet possesses a palatable flavor. The bureau has grown pineapples with thornless leaves, and a cherry tree on which fifty or sixty cherries can be grown in a bunch. The seedless grape, obtained from the muscat of Alexandria, is the bureau's handiwork, and was the result of the selection year after year of cuttings from vines which produced less than the normal number of seeds.

FLOWERS THAT TELL THE TIME.

There are flowers that act as timekeepers for those who have by observation studied their ways and habits, and so punctual are they that laboring men in some countries tell from them when the hour for dinner and leaving work has come; while in certain districts the school children are said to be dismissed when the goat's-beard closes, which it does punctually at the same time every day. The gardener to a millionaire has provided a flower-clock in the shape of a circular flower-bed, with twelve divisions. Each of the divisions, from one to twelve, contains flowers which open or close at the corresponding hour. Thus the two space is occupied by a II., made of hawkseed, which closes at 2 p. m. precisely, and so on. He had no difficulty in finding flowers to suit the several hours, and in some cases the figure has been made of more than one flower. Amongst the flowers used are the snow thistle, blue chicory, pimpernel, marigold, Star of Bethlehem, and evening primrose. The Yellowstone Park contains the most unique greenhouse for flower cultivation in the world, the heat being obtained from one of the natural hot springs, or geysers, the water of which issues from the earth at a temperature near boiling point. The shortest-lived flowers are the dew-flowers of the Death Valley in California. Heavy dews are wafted by the winds from the mountains over the parched plain, and an hour or two before sunrise the moist sand, with its under-current of warmth, gives life to the dew-flower. When the light begins to glow in the east, myriads of tiny pink flowers burst into bloom, hugging the sand for the few minutes they are destined to live. The sun's rays come slanting across the surface, and, as though a touch of fire had passed over them, the dew-flowers wither and disappear.

STRANGE FACTS ABOUT FISH.

Fishes have certain means of demonstrating their emotions, such as erecting their scales or fin rays when under the influence of anger or terror, as feathers or hairs are erected in birds and mammals. As fishes have eyes without movable eyelids, cheeks incased with bony plates or covered with hard scales, which are scarcely suitable for smiling, while external ears are wanting, one can hardly expect to find special expressions, as of joy, pain, astonishment, etc., so well marked as in some of the higher grades of animals, in which the play of the features often affords an insight into their internal emotions.

Change of color is one of the best indexes to the emotions. When the fish is sick its color is apt to be faint, while when in health, angry or breeding the colors stand out brightly and vividly. One of the best examples of the effect of the emotions on color is that of the stickleback. This species has a violent temper, and appears to be always carrying an imaginary chip on its shoulder. During the breeding season combats between the males are exceedingly common. When fighting their brilliant colors stand out vividly, but after the combat is over the defeated one, his gay colors faded, hides his disgrace among his more peaceable companions. Even then he is not left in peace, as the victor seems to take a delight in persecuting him in many ways.

FISH THAT FIGHT.

The parrot fishes are also noted for their "scrappy" proclivities, and the same color changes are noted in them as in the sticklebacks.

Fishes, again, are charged with being voiceless, but nothing could be further from the truth, as more than three hundred species are known to produce sound.

The Sciænidæ are probably the best examples of the falsity of the above charge. These fishes, which are called "maigres," emit sounds having a mean of about twenty-five seconds, and also various notes, usually degenerating into a humming sound, either from excess or want of intensity. When traveling in schools, these sounds may be heard from a depth of twenty fathoms. It has been suggested that the story of the songs of the fabled sirens had its origin in the utterances of schools of these fishes.

When captured the scad, or horse mackerel, the globefish, the grunt, the pigfish, and the hogfish make sounds resembling the grunting of a pig, while one of the best known of the fishes along the South Atlantic seaboard, the croaker, gets its name from the croak it gives when taken into the boat. The barbel and carp also croak when taken out of the water.

A species of Tetrodon is called "seafrog" by the natives of Malabar, India, on account of the noise it makes when captured. The red gurnard has earned the name of "seacock" from the crowing noise which it makes, while another species is called the "piper" for the same reason.

A siluroid found in the Rio Parana, and called the armado, is remarkable for a harsh grating noise which it emits when

caught with hook and line, and this can be distinctly heard while it is still beneath the surface. The Corvina nigra, a fish in the Tagus, emits sounds resembling the vibrations of a deep-toned bell, gong or pedal pipe of an organ. Sea herrings, when the net has been drawn over them, have been observed to do the same, also the fresh water bullhead of our waters. According to Francis Day, he obtained several sheat fishes, Macrones vittatus, locally termed "fiddler fish," at Madras, India, and "on touching one which was lying on some wet grass, it erected its armed spines, emitting a sound resembling the buzzing of a bee, and apparently in anger or fear."

An amphibious siluroid fish, Clarias macracanthus, on being taken into the hand, is said to squeal and shriek. Certain of the blennies also make a noise similar to this. The big Jewfish of the Gulf of Mexico will often break the stillness of the night with his "Boom! Boom!" delivered monotonously for a considerable time.

EXPLANATION OF A CURIOUS LEGEND.

The legend of Pascagoula river and its mysterious music, deemed supernatural by the Indians and the early whites who heard it, has since been explained as the noise made by sea drums. In speaking of this still current legend a recent writer says: "It may often be heard there on summer evenings. The listener being on the beach, or, yet more favorably, in a boat floating on the river, a low, plaintive sound is heard rising and falling like that of an æolian harp, and seeming to issue from the water. The sounds, which are sweet and plaintive, but monotonous, cease as soon as there is any noise or disturbance of the water."

In the days of old Rome the murænas, or sea eels, were supposed to have a regular language, "low and sweet," says an ancient writer, "and with an intonation so fascinating that few could resist its influence," and it is also said that the Emperor Augustus even pretended to understand their words.

When Humboldt visited the South Seas in 1803, about 7 p. m. on February 20 an extraordinary noise startled the crew. At first it was like the beating of many drums in the distance, and then the sounds seemed to come from the ship itself, near the poop. At first the terrified crew thought that breakers were at hand, and then that the vessel had sprung a leak; but it was soon discovered that the sounds were produced by fishes.

Lieutenant White, U. S. N., in the narrative of his voyage to the China Seas in 1824, mentions a similar experience. At the mouth of a river in Cambodia the ship's company was alarmed by remarkable noises around the bottom of the vessel. "The sounds," he says, "were like a mixture of the bass of the organ, the ringing of bells, the guttural notes of a great frog, and tones which the imagination might attribute to an enormous harp. The ship seemed actually to tremble with the vibration. Steadily the noises increased until they formed a chorus around the entire vessel." Subsequently, as the ship sailed on, they diminished, and finally ceased. A native interpreter stated that they were made by a kind of fish which clung to objects with its mouth.

MUSICAL FISH.

Sir J. Emerson Tennent tells of a visit he made to Ceylon in 1848, when he went in a boat to hear some famous water music at Batticalva. He was rowed quietly to the spot by moonlight, where the sounds came up from the water like the gentle thrills of a musical chord or the faint vibrations of a wineglass when the rim is rubbed with a moistened finger. It was not one sustained note, but a multitude of tiny sounds, the sweetest treble mingled with the lowest bass. The natives said that the music was made by a shellfish at the bottom, which they called the "crying shell."

Fishes are supposed to make these noises for the purpose of attracting their mates. It is said that fishermen often take fish during the spawning season by imitating the sounds.

Formerly it was believed that fishes could not hear, as they had no ears, but anatomists have proved that they have organs of hearing, though not external ones. As water is denser than air the sounds made in the latter do not penetrate the former readily, and, unless they are sufficiently loud to produce well defined mechanical vibrations in the water, are not apt to be heard by fishes unless they should happen to be close to the surface. It is very probable that most of the fishes cannot distinguish and appreciate differences of tone, as the higher animals are enabled to do. There are numerous well authenticated instances of fishes responding to noises in the air, which would seem to indicate that certain species have their hearing much better developed than others.

FISH THAT DANCE.

Many ancient writers have described the fishes' love of music, and Rondolet, the famous naturalist, tells how on one occasion he made a school of shad dance to his fiddling.

It is said that in Germany Clupea finta delights in musical sounds. Therefore, when fishing the fishermen fasten to the nets bows of wood, to which are suspended a number of small bells, which chime in harmony together on the nets being moved. The fish are thought to be thus attracted to their destruction, and as long as the alluring sounds continue they cease all efforts to escape. The same method is followed on the Danube River when fishing for certain species.

The legend that they were caught in Egypt by singing to them is not without its plausibility. In Japan the tame fish are summoned to dinner by melodious gongs, while on the Dholpore River, in India, they are called up out of the muddy depths by the ringing of a handbell. In Europe it is common for carp and goldfish in private ponds to respond to the whistle of the person who feeds them, no matter at what time he calls. In Tahiti the native chiefs have pet eels, which come to the surface when their master whistles, while they pay no attention to the calls of strangers.

In Sweden, at the present time, the church bells are not rung during the bream season, lest the fish should take flight and desert the region, while during the pilchard fishery the people are no less careful of their sensitiveness to sound.

The natives of the Gold Coast Colony, West Africa, when fishing on the inland waters or rivers on moonlight nights,

make use of a piece of glass—broken bottle generally—and metal, thereby making a musical tinkle to attract the fish before the hand-net is cast.

TASTE AND SMELL IN FISHES.

The sense of taste is evidently not well developed in fishes, and this is very evident from the circumstances under which fishes seize and swallow their prey. Those species which are carnivorous are of necessity compelled to catch with their mouths and retain a firm hold of the active and slippery food they are destined to devour; to divide or masticate their food would be impracticable and even were they permitted to do so the water which perpetually washes over the exterior of their mouths obviously precludes the possibility of appreciating savors.

As the olfactory nerves are of large size and cover a wide surface, the sense of smell in fishes is acute, and this is evident from the selection they make in their food. Fishermen know well that tainted bait is not so tempting as fresh bait; a very hungry fish will not be particular, but the odor of stinking bait is repugnant to fishes generally. Fishes are also attracted by agreeable scents, as was first proved by Aristotle.

FREAKS OF THE EQUATORIAL JUNGLES.

A toad is about the last thing in the world that one would expect to find musical, but in the Caribbean Islands a toad that whistles is common in the mountains. Woe be to the luckless person, however, who tries to sleep in the immediate vicinity of a whistling toad. Her musical efforts are very tolerable when heard at a distance, but when Mrs. Toad perches on the top of a tree-fern close by your bedroom window and whistles an epic in two hundred stanzas, the only chance of obtaining sleep is to put your head under the mattress. The tree toad's whistle smites the eardrum like concentrated thunder.

Another "musical" denizen of the jungle is a modest insect that spends half of its lifetime trying to extricate its feet. This peculiar insect is known to the natives as "the drummer" and has an unaccountable provision of Nature attached to its feet in the shape of little suction cups.

They say there is use for everything provided by generous Dame Nature, but if you saw that poor "drummer" insect crawling up a window pane, pulling its sticky feet after it, you would shed copious tears of sympathy—or laughter. Every foot it places sticks and the feet it uses to strengthen its pull become fast also. Only its two front legs are devoid of the mysterious suction cups, and when occasionally all its legs get stuck the poor bug batters the surface upon which it has become fastened with such violence that the sound produced is exactly like the beating of a distant kettle drum.

One marvels what Nature had in mind for that bug, also for another that swarms through the bungalow in the month of May. This one spends three-fourths of its time trying to get on its feet. It is a fat, unwieldly insect which the natives call the "May bug," although it might well be called the "bibulous bug." Every time it alights it tumbles over on its back

and, being rather corpulent and no policeman being handy, it experiences considerable difficulty in getting right side up again.

Another seemingly unfortunate creation is the "blind bug." The mystery of this unfortunate creature's existence is that it toils all day long pushing a piece of clay or a stone from place to place without rhyme or reason. In the long jungle afternoons I have watched this blind bug at work, pushing and pushing and pushing a stone that was ten times its own weight. In the course of an hour it would move that stone about fifteen yards, when the bug would suddenly leave off and begin to push another stone in an entirely opposite direction.

SOME CURIOUS CAPRICES OF ANIMALS.

Catnip, or cat-mint—which is the correct name of the plant—is so termed from its curious effect upon the cat tribe. The average domestic cat prefers a few drops of catnip essence to a saucer of cream. The creature will lie down and roll in ecstacy on a rug sprinkled with the scent. Valerian, made from the Valeriana officinalis, a plant common in English hedgerows, has a similar and even more powerful effect.

The fact is well known to stealers of valuable cats. They are careful to keep about them a supply of valerian tincture. A cat well provided with this pet delicacy will even forget its home and become quite content among strange surroundings.

All the cat family, even lions and tigers, seem to share this strange partiality for certain scents. A lion that is, or was, in Mr. Hagenbeck's collection, delighted in nothing more than lavender water. At other times a troublesome and treacherous creature, it was perfectly contented when a handkerchief soaked in lavender was given to it. It would sniff it and eventually tear it to pieces, purring all the time. This taste was made use of when its keeper wished for any reason to enter its cage.

Dogs, on the other hand, and all their tribe, detest the scents dear to the cats. A drop of lavender water, or any of the scents made with alcohol, placed on a dog's nose, drives the creature almost frantic. They have, however, their own preferences, as dog-stealers are well aware. Oil of aniseed, made from the anise plant, is perhaps the most peculiar. By rubbing some of this on his clothes, a professional dog-stealer will entice almost any dog to follow him.

No creature in a state of nature is likely to acquire a taste for intoxicants. Yet that many creatures possess such a taste is beyond doubt. Foremost amongst these are monkeys. So much is this the case that an intoxicating drink made from the fermented juice of rice is almost invariably used for catching these creatures. Carrying a gourd of this intoxicant, the trapper takes a little sip before the eyes of the monkeys, and then, dropping the gourd, goes on his way. At once there is a rush for the liquor, and when, an hour or two later, the man returns he finds the glade strewn with monkeys, all in the last stage of intoxication.

Nor are monkeys the only animals which are fond of spirituous liquors. Elephants will drink brandy by the bottleful. Bears are notorious tipplers. Many performing bears find their highest reward in honey and beer or rum-and-water mixed with sugar.

Even birds share this peculiar taste. Geese are the worst of feathered topers. Geese will eat a whole bed of lettuce if they can get at it, and, affected probably by the narcotic properties of the plant, then fall into a state of coma, which may last twelve or fifteen hours.

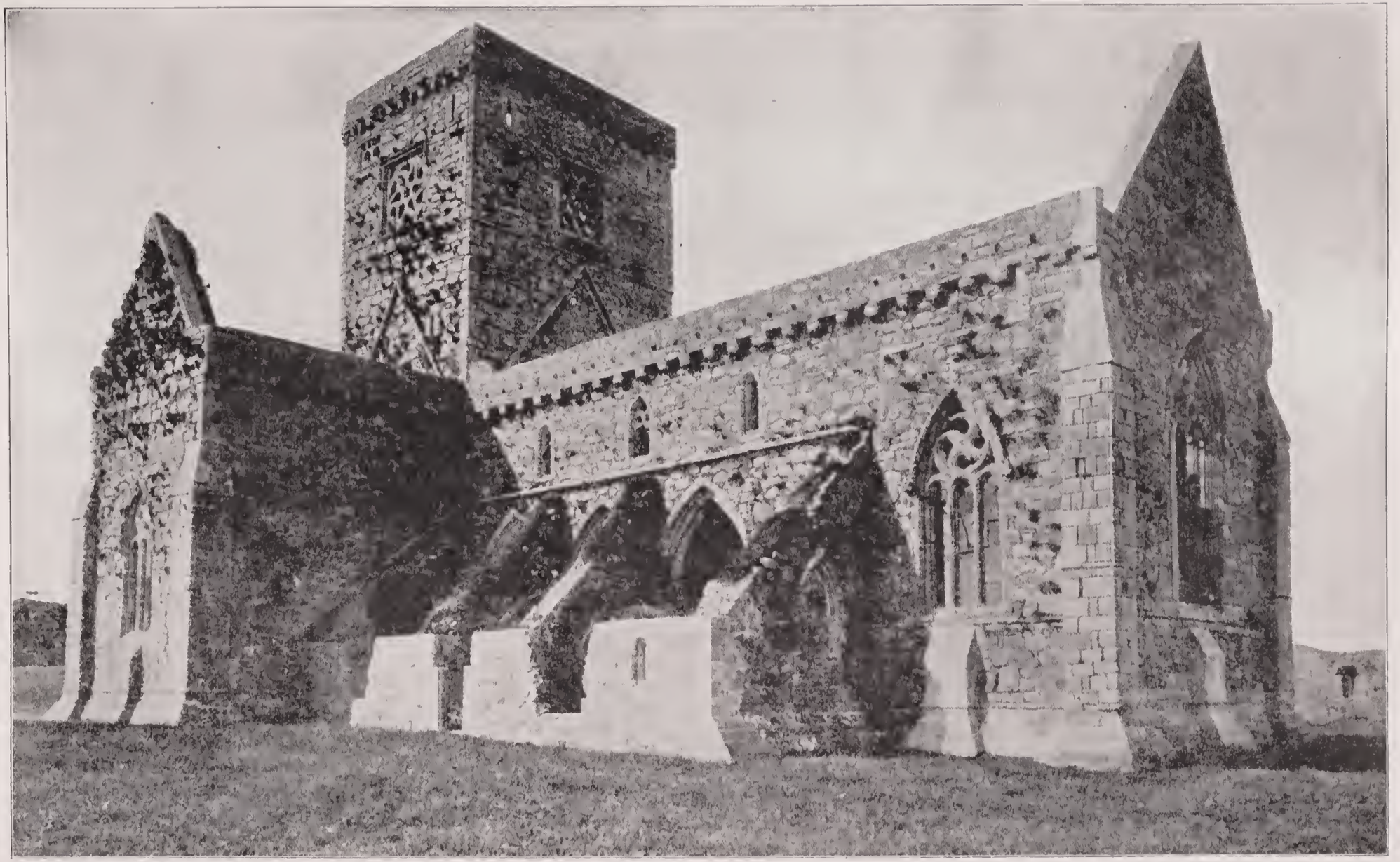
A LOTHARIO AMONG BIRDS.

Since the time when Jenner first had the good luck of witnessing the curious scene in which the young cuckoo ejects its foster brothers and sisters from the nest, this bird has always excited a great deal of curiosity. In the female cuckoo the nesting sense appears to be atrophied. "She does not think," says a writer, "of making a nest, though that the instinct has not died out of the breed is evident from the fact that at least one of the species builds a nest like other birds. But in England the female cuckoo lays her egg at the hedge root, and afterward carries it in her bill and deposits it in the nest of some other bird. Probably connected with the dwindling of the maternal instinct is the fact that in the cuckoo the males far outnumber the females. It is generally reckoned as a sign of decay either in a nation or in a species of birds when this occurs. As long as a country, for instance, produces more females than males it remains strong, healthy and aggressive; but when this ceases to be the case and the males outnumber the females, decay sets in. Thus the cuckoo must be described as the decadent among birds, and, in spite of all the poetry written about him, not a very pleasant creature either. We welcome him in spring, not as we welcome the nightingale for the sweetness of his note, but because he is the harbinger of spring and all that is meant by it.

A CONSCIENCELESS MALE.

"As is natural the male bird displays no parental instinct at all. He courts his mistress and then forgets all about her. Far from sitting on the egg, as many male birds do—notably the ringdove, which spends as much time on the eggs as the female—he never sees the egg which is laid. The mother has just about as little regard for it. Her care lasts no longer than the moment at which she drops it into another nest, and investigation has shown that she is not very particular even about that. It used to be held by naturalists that the cuckoo always chose to put her egg beside others which were similarly tinted. But this is not so, as might be proved from the single fact that the hedgesparrow's nest is one which she greatly patronizes, and here the eggs are sky-blue in color and no cuckoo ever laid an egg like them. Besides, there is scarcely one of our common wild birds whose nest has not been made the receptacle of a cuckoo's egg, and the coloration would indeed have to vary if it was to be suitable in each instance.

"But it is on hatching that the hideous



Iona Cathedral. Site of the beginning of both Christianity and the Monarchy of Scotland. The smaller ivy grown walls are among the oldest in Scotland, their authentic record being far back into the early centuries.

tragedy takes place for which the bird has earned an evil fame. Self-preservation, it has been said, is the first law of nature, and, as a matter of fact, the only thing that can be predicted of life in its simplest form is that it strives to keep itself in being. But in no other creature does this instinct take a form so abhorrent as it does in the young cuckoo, which, while it is a blind, shapeless, naked little monster, begins to elbow its companions out of the nest and cast them to the ground, where death is certain and almost immediate."

GOVERNMENT OPINIONS OF THE TOAD AND THE QUAIL.

REMARKABLE INVESTIGATIONS BY THE AGRICULTURAL DEPARTMENT.

Uncle Sam has taken up the toad. He has also taken up the quail, but it is his appreciation, long delayed, of the common or garden hoppy that makes the heart well with joy.

Just the common or garden toad—the little fellow with the long red tongue and the sleepy eye—Uncle Sam says his usefulness to the farmer, amateur or otherwise, is in direct ratio to his ugliness.

THE TOAD.

The toad, he says, in a book issued by the Department of Agriculture, has always borne the burden of false and even ludicrous misrepresentations. We have taken too much for granted, as, for instance, that it has venomous qualities; that it has medicinal virtues; that it carries a jewel in its head—even the Bard of Avon told us this—that it can produce warts; that it can poison infants by its breath; that it will bring good fortune to the house in whose new made cellar it takes up its abode; that it will cause bloody milk in cows if killed by design or even by accident; that it will cause rain if stepped upon.

Alas, alas! all these assertions are figments of diseased or superstitious brains.

Believe them not, says Uncle Sam.

Having polished up the reputation of the toad Uncle Sam passes on to its family life. He speaks poetically of the song of the male as it wooes its mate—that soft, drowsy, musical trilling which Gibson calls "the sweetest sound in nature," but which the country boarder calls things that are not really fit to print.

He tells touchingly of the perils that envelop their early years—perils from fish and bird and sun and air and water.

But he finds that in toadland there is no croak for race suicide. President Roosevelt will be pleased to learn that every conscientious female toad will bring into the world something like 9,000 little ones in the course of one gestation.

When the toad wants a new suit he does as does his brother, the snake, who casts off the old. He is a frugal beast, for he eats his old clothes.

Examination shows that at least 98 per cent of the toad's food is of animal origin.

WORMS.

The common angleworm was present in fourteen stomachs, principally in toads taken after showers, and formed 1 per

cent of the total food. Rains drive the worms to the surface, where they fall easy victims to a particularly hungry toad. From the study of toads in confinement it appears that worms are not preferred by that animal as an article of diet, but may be eaten.

Worms are of great service in tilling and aerating the soil, as Darwin has so well shown. On the other hand, they often cause great annoyance in greenhouses and in flower beds out of doors. Since the toad frequents the abodes of man, it seems probable that the good done by worms in such localities may well be offset by their damage as above mentioned.

Snails are a serious pest in greenhouses and gardens, where their depredations on lettuce and other succulent plants are well known. Several of the large naked snails common in gardens were found in the stomachs, while, in the case of the shell-bearing snails, it was found that the acid stomach juices of the toad were sufficient to dissolve the shell in a short time.

Sunbugs, which damage the roots of orchids, violets, pansies, roses, etc., were found. Here the toad rendered a great service.

Thousand-leggers, the bane of potatoes and truck vegetation, were welcome always inside the toad. Spiders were a desirable and plentiful entree.

GRASSHOPPERS.

Grasshoppers and crickets fell before him, but, alas, so did the ant. This is debatable ground, and as the owners of the stomachs had gone to toadland's happy hunting ground let us speak no evil of them.

Beetles went to make up 8 per cent of the total food of the reptile; cutworms and army worms, 28 per cent; tent caterpillars, between 9 and 10, and miscellaneous ones, all harmful, formed 3 per cent.

Some of the stomachs belonged to toads which had been having a moth feast under some electric lights.

The lamps have a strong attraction for the moths, and the toads make sure that few if any escape. This imported European pest has now become well established in several New England states, particularly in residential districts. It is here that the toad is most valuable as a destroyer.

THE QUAIL.

Now as to the quail, Uncle Sam has found that it also is a great destroyer of the noxious worm and bug.

In the investigation 651 stomachs were examined, collected in every month of the year, though mostly during the hunting season, and obtained from twenty-one different states, and from Canada and the District of Columbia, but chiefly from New York, Maryland, Virginia, Florida, Ohio, Indiana, Illinois, South Dakota, Nebraska, Kansas and Texas.

As indicated by this material, the bob-white is notable for the great variety of its food. It lives mainly on seeds, fruits, leaves, buds, insects and spiders, though myriapods, crustaceans, mollusks and even batrachians have also been found in its stomach. The character of the diet varies with the season. The greatest proportion of animal matter is taken in late spring and early summer.

The food for the year as a whole, estimated from the analysis of the contents

of stomachs, and calculated by volume, is divided thus: Animal matter, 14.93 per cent; vegetable matter, 85.07 per cent. The elements of the animal food are distributed as follows: Beetles, 6.38 per cent of the total food; grasshoppers, 2.56 per cent; bugs, 2.83 per cent; caterpillars, 0.87 per cent; miscellaneous insects, 0.48 per cent; other invertebrates, largely spiders, 1.81 per cent.

The vegetable food consists of grain, 23.64 per cent of the total food; various seeds, chiefly those of weeds, 50.78 per cent; fruit, 8.53 per cent; miscellaneous vegetable matter, 2.12 per cent.

MEN AND BEASTS.

A COMPARISON OF STRENGTH IN A GREAT ANIMAL SHOW AT MADISON SQUARE GARDEN, NEW YORK CITY.

An eighty foot cable was attached and 100 of the strongest men in the circus commenced to tug and haul. In spite of the combined strength, however, only 6,700 pounds was registered, or a paltry 67 pounds per man. Everyone was disappointed, especially the men themselves, who declared that they were not yet "warmed up to the job," and hoped they would be allowed another trial after the animals had had a pull. This request was granted.

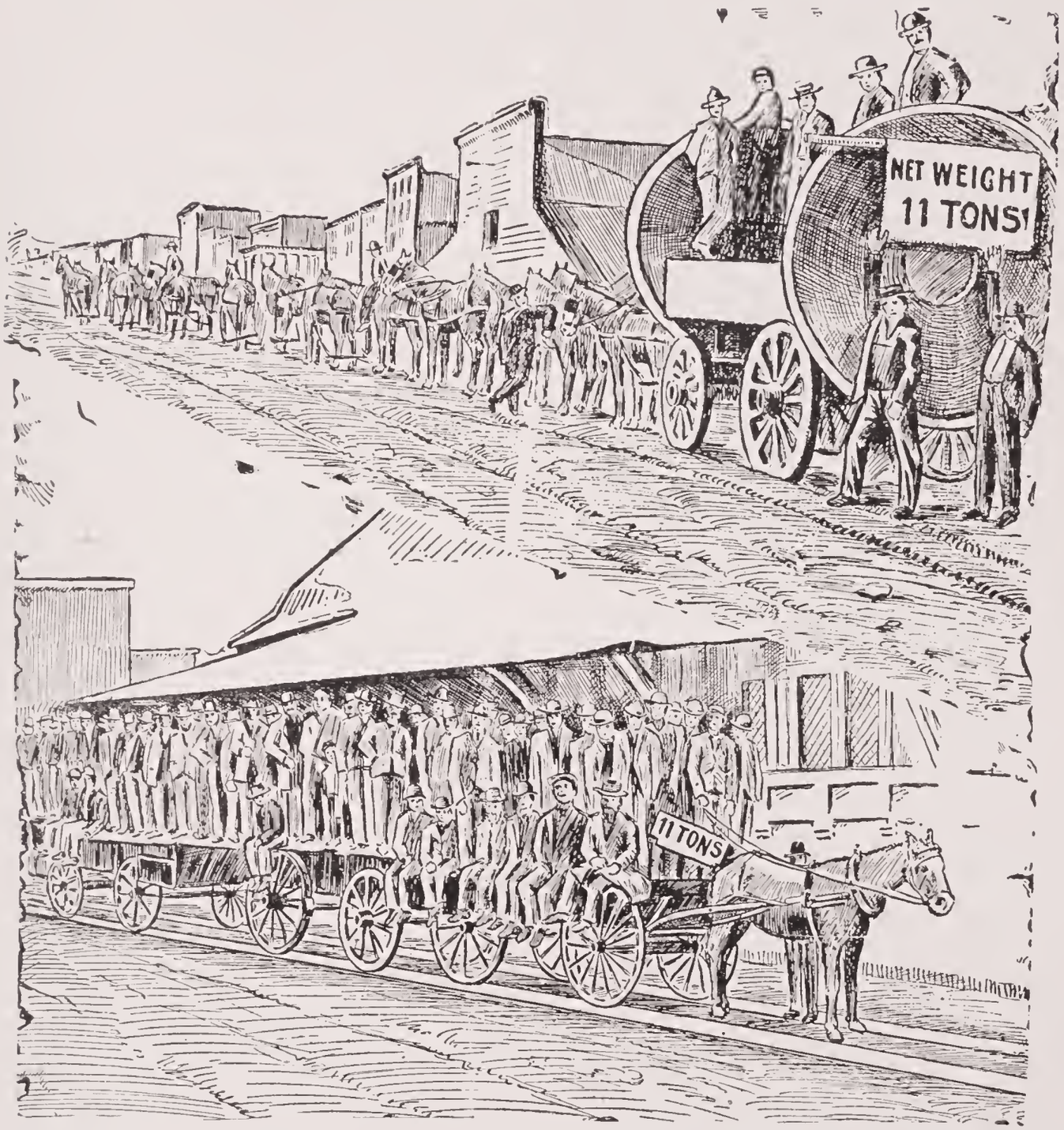
Then a couple of draught-horses were attached, and after pulling until their veins stood out like cords registered 2,700 pounds. At the request of the writer the length of the hawser was reduced to 10 feet and the horses given another chance, with the result that they managed to send the indicator to the 3,750 pound mark. Six horses on the long rope registered a pull of 5,750 pounds, but when brought close to the machine sent the indicator up to 8,875 pounds.

A couple of camels that had been in harness a few times only were next led in and, in spite of much protest, attached to the hawser. But camels are not great pullers, and the very best they could do was 2,750 pounds. When the camels had been taken back to their stalls a couple of gentle zebus, or sacred cows of India, were led into the ring, yoked together, and attached to the hawser. The pretty creatures started off as though determined to show the spectators what real strength was, but as soon as the strain came they slackened, and in the end succeeded in registering—nothing, for the lowest mark on the register was 250 pounds, and even the combined strength of the two sacred animals was not equal to such a pull.

The 100 men now indicated that they were sufficiently warmed up for another pull, and one of the spectators, who had been in the navy and therefore knew all about "tugs-of-war," offered to place the men in those positions best suited to bring out the greatest amount of strength. As a result the original pull of 6,700 pounds was increased to 12,000 pounds and held for a matter of 40 seconds. With this record the men were contented to make way for "Babe," the sweetest-tempered and wisest elephant in the circus. She is, however, Babe in name only, for she scales close onto six tons, and takes

pleasure in pushing heavy freight into the cars when the show is on the move.

As it was not intended that Babe should show her strength by pulling only, that being secondary to her powers of pushing, a huge wagon was rolled into the arena, attached to the back of which was a nice soft pad against which she could rest her head. The rope from the register was then attached to the axle of the wagon and Babe invited to "shove." She had no objection and started right away, sending the indicator up with a bound to 4,500 pounds. Then, as the wagon refused to budge, Babe became annoyed. She had pushed many a vehicle



Differences in horsepower on average dirt roads and on a smooth track.

before, but never had she tackled so obstinate a one as this. Exerting all her strength and squealing with indignation, she "went for" that wagon, broke the hawser, and gave the ponderous cart such a jolt that one wheel flew off, while part of the back caved in. After it had been repaired a crowd of circus men jumped in and Babe had another try, increasing the former push by 500 pounds. After that she was joined by another elephant, when the two together succeeded in registering 6,500 pounds.

Then it was decided to see what Babe could do as a draught animal. A collar was fixed to her, which called forth some indignant trumpeting and an attempt to rip it off by means of her trunk. But Whiting Allen, her much-loved keeper, soothed her with a few words, and as soon as the rope was attached started her on her pulling contest. With a slow but sure strain she succeeded in making the magnificent record of 8,700 pounds, or a fraction less than the combined pull of six horses. The result was received with many cheers and much surprise, for it had always been supposed that an elephant's push was superior to its pull. Babe's performance being the last on the programme, no further tests were made that day, though it was decided at some future date to record the strength of other animals in the circus. The results of these interesting tests proved without a doubt that in proportion to his size man's pull is superior to that of animals, so that his right to be regarded as the "lord of creation" is justified.

STRENGTH OF INSECTS.

The wing strength of insects is known because of the work of Felix Plateau and De Lucy, who showed that these little creatures could not raise a weight much heavier than themselves, no matter what the surface of their wings. During the course of these experiments a very interesting fact was discovered, namely, that the size of the wing decreases as the weight and size of the animal increases, a fact which explains the slow, heavy flight of the beetle and the swift, light movement of the gnat.

The case is entirely different, however, where the creature moves on a solid surface where its six feet may obtain points of support. In this case we can approximately calculate the force exercised. Take, for example, a fly by the wings, leaving the legs free so that they may seize and raise a match, as shown in figure two. If a man wished to perform relatively equal labor he would have to raise a beam 24½ feet long by 14½ inches square. The earwig, harnessed to a small chariot, drags without difficulty eight matches which for a large percheron horse would mean dragging 330 beams as long and thick as himself. The man who leaps the 300 metres of the Eiffel tower is merely repeating the action of the flea, which can leap 200 times its own height. It would require a Hercules able to raise eighty large locomotives to equal the relative strength of an oyster, which in closing its valves exercises a force of fifteen kilograms. Thus it is a much more simple thing to calculate the strength of insects than to equal it, and our modern athletes have yet a long road to travel before they can compete with animals occupying very humble positions in the living world.

THE LIFE HISTORY OF A SPLASH.

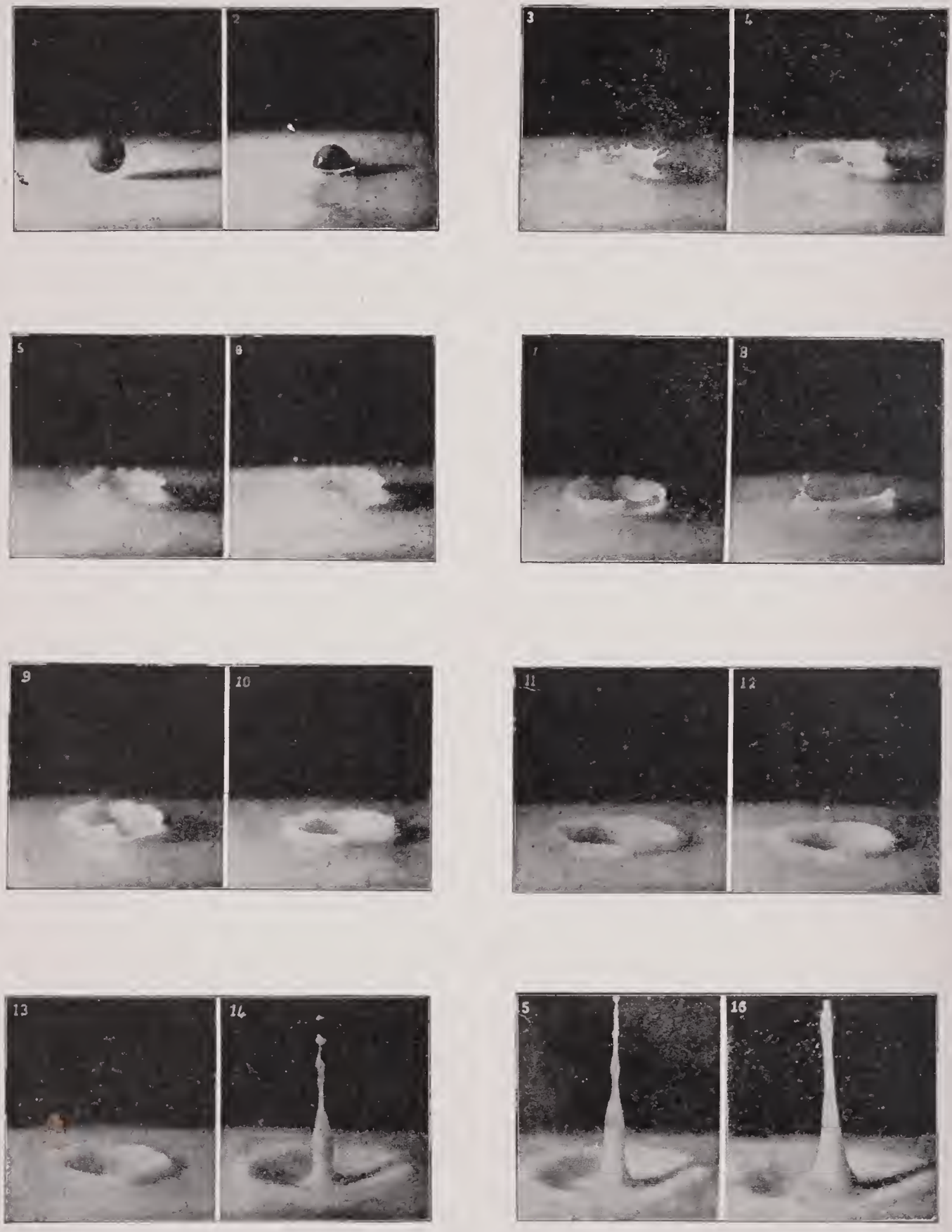
These photographs were not obtained by the ordinary Cinematograph process (which would be too slow), but by a refinement upon it. For each picture the ball was allowed to fall into the fluid, only the exposure was delayed each successive time by an increasing fraction of a second. The total result is a complete record of a single splash. The exposures were made by the light of an electric spark lasting between ten and seventeen ten-millionths of a second. The timing is under perfect control. By the use of a specially designed chronograph, the ball may be photographed at any period after its release to a thousandth of a second up to three seconds.

In the second photograph we see the steel ball half embedded in the fluid (which in this case is water to which, for photographic reasons, a little milk is added), and notice that it is surrounded by an exceedingly beautiful ring or sheath of fluid, which bears on its outside edge some fine fronds. The liquid seems to be repelled in some mysterious way from the ball, giving the surrounding ring a curl outwards. No. 3, photographed a two-hundredth of a second later, shows the coronet at its best: the fronds or spikes are now plainly discernable. Their life is a very short one, owing to the action of surface-tension, which may be described as the steady pressure of the elastic skin which science assumes all fluids to possess.

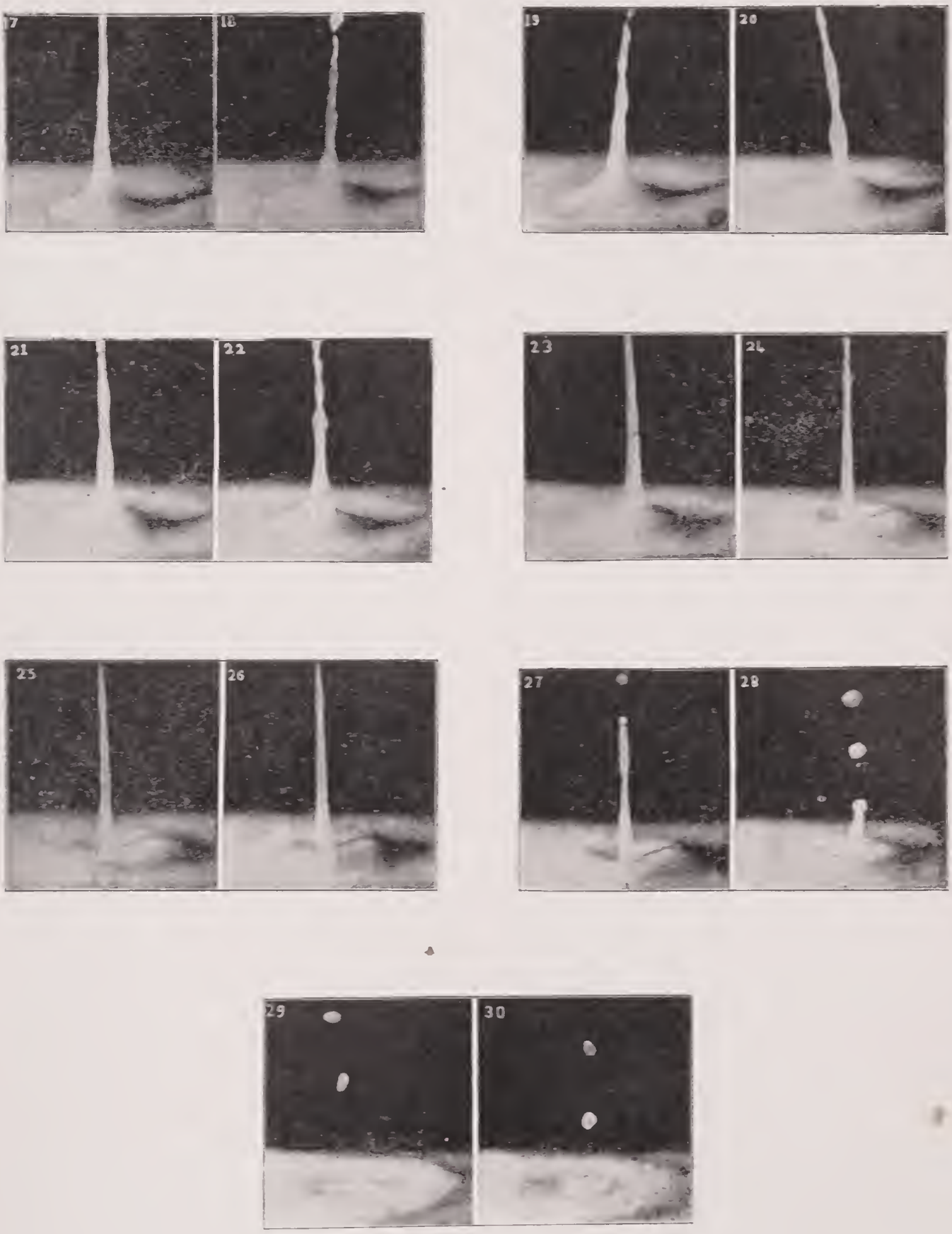
It will be noticed that under this influence our fairy coronet has quite lost its fronds. In the fourth photograph they have nearly disappeared in the form of tiny spots, all but invisible in the reproduction. The base of the frond has thickened into the form of a "lobe" projecting from a rim of fluid, which now bears the appearance of a "crater" rather than that of a coronet. Our beautiful fairy coronet finally becomes a mere ring surrounding a hole in the water, of the depth of which the photographs give but little idea. As water is incompressible, it follows that the level of the water in the vessel must have risen according to the size of the hole.

Although there is very little alteration in the surface appearance between Nos. 10 and 12, great things are happening down below, the result of which is the emergence of the jet in No. 14. It shoots out of the crater with great velocity, and, although the extreme tip can be just seen in the centre of No. 13, it attains the dimensions shown in the next photograph in a two-hundreth of a second.

At a depth equal 3 1-7 times the diameter of the ball the hole divides, and, owing to the upward thrust of the displaced fluid trying to regain its original level, and the pull of the elastic lining of the hole, a pillar shoots up. In Nos. 14, 15, 16, note the remains of the crater, and its gradual development into the first concentric ripple, the familiar phenomenon observed when a stone is thrown into a pond.



Photographs of progressive effects from a bullet dropped into fresh milk.



Time between the photographs, one-thousandth part of a second.

NATURE'S GREATEST FREAKS.

WONDERS OF THE DESERTS.

Iceland has a central region composing the greatest and strangest lava desert in the world. The rims and shells of lava are formed in the most shaggy and ragged shapes to be seen in any such regions. Whole cities can be easily imagined from the curious structures, and the scene is given reality by the wreaths of smoke that curl up as from sepulchral homes and elsewhere burst forth in volumes as from great foundries and furnaces of a manufacturing city.

California has its Death Valley that surpasses all other freaks of earth in its paradoxical extremes. At one point it is 200 feet below the level of the sea for seven miles. In this place the sun beats down with an average of about 125 degrees of heat upon borax beds where there is not a breath of stirring air or a drop of moisture. Around this death pot are precipices ranging from 1,000 feet to two miles. This place is 350 miles from the Pacific ocean in Inyo county, near the Nevada line. The entire valley is a part of Mojave and Colorado deserts, and is about one hundred miles long by half as wide. It has continually many wonderful mirages known to the Indians as Big Spirit pictures. They remain oftenest but a few minutes.

MAKING A DESERT.

At the persistent rate of fourteen and a fraction inches every hour, twenty-eight feet five inches per day, or two miles a year, the Great Salt Lake is disappearing. The shore lines of this mysterious tideless, inland sea, nestling among Utah's hills 4,000 feet above the ocean's level, are now contracting day by day to their common centre at a speed visible to the naked eye, and which will mark the lake's total obliteration within the next twenty-five years. Possibly before the year 1930 the last drop of the Great Salt Lake will have evaporated, leaving nothing behind but a huge barren salt plain capable of furnishing the whole world's salt supply for many centuries to come.

This strange lake is the most remarkable body of water in the world. It is nearly 3,000 square miles in area, lying 1,000 miles inland, at an altitude of 4,250 feet, and its waters are six times as salt as those of the ocean.

The contents of the lake were recently estimated at 1,505,433,600,000 cubic feet, and yet, in the opinion of Professor W. J. McGee, of Washington, all of this vast body of water will have totally disappeared within the next twenty-three years. Other geologists who have made a careful study of Great Salt Lake have estimated that from twenty-seven to thirty years will elapse before the last trace of this once enormous inland sea shall have vanished.

So alarming, in a sense, has the drying up of Great Salt Lake become during the past few years that at the instigation of the government the United States Geological Survey, Division of Hydrography, has been making a thorough investigation to determine the causes leading to the lake's disappearance, and the possible outcome after the last trace of the big inland sea has been wiped out forever. A pre-

liminary report of the Geological Survey says:

"The decline in the surface of Great Salt Lake is causing apprehension among the people of Utah. This interesting body of water has been steadily sinking for a number of years.

"The movements in the waters have been thought to be related to the development of agricultural and grazing interests, which divert large quantities of water from the streams which feed the lake for use upon the land. During past years the cutting of the timber on the neighboring mountains has been unusually heavy, practically destroying the forest protection of the head waters of a number of streams whose waters flow into the lake. The cutting of these forests is supposed to have injured the flow of the streams, and thus to have affected the lake level."

Great Salt Lake received its name from Brigham Young in 1847.

GEYSERS.

Iceland's geyser district is about ten miles in width and within seeing distance of Mount Hecla. The group of largest spouters are about 360 feet higher than the town of Reykjavik and they are about 600 feet apart. Strokkur is the largest. A sound like a heavy roll of subterranean thunder is heard and a column of water rises about 800 feet, from which a cloud of steam seems to go on into the sky. Six minutes is about the average duration of an eruption, though now and then one continues for an entire day. South Dakota has its Bad Lands, which are bad enough, but far from being as bad as supposed by the early explorers. Its fossils and petrifactions are of great interest to scientific collectors, and its strange colors and forms are the wonder of travelers. Many fertile valleys lie among its hills and gulches, where thriving families find the most picturesque homes.

Africa has its vast Sahara, Asia its Arabian desert and the desert of Gobi, but they are only wide stretches of hot, sandy plains, of little interest to any but the camel drivers who take the merchants and travelers across to more hospitable places.

OCEAN STREAMS.

The Gulf Stream rises in the Gulf of Mexico and reaches a velocity of five miles an hour where it passes off the coast of Florida. It is about 200 miles wide where it passes Newfoundland. Here it turns across the Atlantic, where the warm water brought from the south gives to England its fogs and warmth of climate.

THE SARGASSO SEA.

This vast accumulation of seaweed is the result of the current of the Gulf Stream bringing drift to that point from its long course. The living and dead vegetation there is so thick that no ship can go through it.

THE MAELSTROM.

This is the greatest whirlpool in the world, and was once famed by many thrilling stories. It is situated off the coast of Norway, between the islands of Loffoden and Moskoe. It is caused by the tide flowing against a rocky angle of the shores, causing it to turn upon itself. The whirl is about a mile and a half in diameter.

GLACIERS AND ICEBERGS.

Greenland is the home of glaciers and the birthplace of icebergs. The vast gorges of the mountains inclined toward the sea are filled with snow that becomes packed into ice and under the tremendous pressure of countless weight it yields enough to move slowly like a sluggish stream downward, to the end in the ocean. There the enormous ends are broken off to float away as icebergs. Seven-eighths of the mountain of ice is submerged and yet the icebergs often tower higher than the tallest masts of a ship.

PITCH LAKE.

Trinidad has a fresh water lake of 300 acres, the surface of which is covered with pitch from a spring of asphalt that bubbles up in the centre and hardens upon exposure to air upon the surface of the water. The lake is eighty feet above sea level, but no soundings yet taken have been able to find any bottom at the centre in the asphalt fountain. It is estimated that enough pitch can be secured from this place to pave all the streets of the world so long as there are cities with streets to pave.

CRATER LAKE.

Oregon has a crater lake about 140 miles from the Pacific and seventy miles above the California line. The lake is 6,251 feet above the sea level and is in a basin whose precipitous walls are from 500 feet to 2,800 feet high. Its centre has a wide depth of 2,008 feet. The water at the surface is higher than Mount Washington.

PETRIFIED FORESTS.

On a plateau 5,500 feet high is a forest of fir trees over a section of eight square miles that has been turned to stone. Scientists can find no data from which to estimate the period when this was done. The theory has been advanced that a volcanic shower of ashes buried the forest, and inundations of water from limestone regions completed the process of petrifaction. These trees are covered with a coating of sand and gravel indicating the action of water.

The largest forest of petrified trees is to be found in Arizona. It has now become a National Park, and is in the care of the United States Government. Anyone who intrudes unlawfully, or who does unlawful damage, is subject to a fine of $5,000 and imprisonment for twelve months.

The forest covers an area of nearly 100 square miles. Within its bounds the wonderful trees are scattered in wild confusion. Not one is standing—most are broken into huge sections, stripped of limb and twig—great, glistening logs of rock.

Time was when the forest giants were sturdy with life and mantled with luxuriant foliage. This was not many centuries ago, but ages and ages ago—in short, millions of years ago, so the record of geology declares. When they tossed their branches to the breeze the American continent was in the beginning of its formation.

When they died they were carried some distance by streams and waterlogged. Here they were turned into stone, the wood, as it decomposed, being replaced by the silica in the sand that gradually covered it. Particle by particle each cell was replaced by mineral matter, so that the original form, to the minutest

details, was exactly reproduced. Then the waters gradually subsided, leaving the stone trees on dry land. That, at least, is the scientific explanation of the wonderful stone trees found on the American continent.

THE LARGEST VOLCANO.

Mauna Loa is the great volcanic lake of Hawaii. It is 13,700 feet above the sea. The crater is 6,000 feet in diameter, within a ragged wall 1,000 feet high. This parent crater has several offsprings at its side. The most noted of these is Kilauea, which has an area of nearly 3,000 acres.

Maui, an island contiguous, has an extinct volcano having a crater with an area of nineteen square miles.

YELLOWSTONE NATIONAL PARK. THE GREATEST NATURAL WONDERLAND ON EARTH.

Lofty mountains, mighty cataracts, deep canyons, many colored cliffs, spouting geysers, mud volcanoes and the last home of North American wild animals, are a few of the wonders of the region known as Yellowstone National Park.

This national reservation, set apart for public uses by an act of Congress passed in 1872, covers a tract of about sixty-five miles in length, from north to south, and about fifty-five miles in width, from east to west, lying chiefly in northwestern Wyoming, and overlapping, to a small extent, the boundaries of Montana, on the north, and Idaho, on the west. This gives an area of 3,312 square miles, a tract that is nearly the area of the states of Rhode Island and Delaware combined, and nearly half as large as the State of Massachusetts. The Rocky Mountain chain crosses the southwestern portion in an irregular line, leaving by far the greater expanse on the eastern side. The least elevation of any of the narrow valleys is 6,000 feet, and some of them are from 1,000 to 2,000 feet higher. The mountain ranges which hem in these valleys are from 10,000 to upward of 11,000 feet in height, Electric Peak (in the northwest corner of the park, not far back of Mammoth Hot Springs) having an elevation of 11,155 feet, and Mount Langford and Turret Mountain (both in the Yellowstone Range) reaching the height of 11,155 and 11,142 feet respectively.

VOLCANOES AND EARTHQUAKES.

Scientists have many theories concerning volcanoes and earthquakes, but none are so popularly accepted as that of internal fires causing explosions by the generation of gases. In fact, it bears all the phenomena of a vast boiler explosion to which geysers and similar eruptions bear strong collateral testimony. Streams of melted rock have been known to run twelve or fifteen miles before cooling enough to solidify.

It is supposed that the crust of the earth is not more than thirty miles thick in some places and that at fifty miles all substances are there in a fluid state, held compact by the weight of the solid crust.

Two lines of volcanoes circle the earth as though along a region of weakness or fissure in the crust. One runs from the north pole along the line of mountains in western America, around along the eastern coast of Asia. The other passes through Hawaii, Mexico, the West Indies, Italy and Asia Minor. Where these lines

cross are the most active volcanoes. A curious thing is that some of these volcanoes on different parts of the earth appear to be connected. It has long been known that any special activity in Mount Hecla, of Iceland, will produce a similar activity in Mount Vesuvius, of Italy.

Artesian well at Guilford, West Australia. Surplus 1,120,000 gallons daily.

Volcanic disturbances and earthquakes are so intimately connected that whatever explains the one will probably explain the

other. Japan, Italy and the West Indies have suffered the most from earthquakes and the record of persons destroyed ranks next in numbers to the destruction of wars.

GREAT CAVES.

Subterranean caverns are always mysterious and interesting objects. They are most usually caused by the action of water either in the action of waves or by percolating down through the earth and dissolving the softer substances below thick strata of rocks.

The most famous wave-made cave is that of the Blue Grotto of Capri Island in the Mediterranean near Naples. It can be entered only by small boats during a calm sea. The cavern runs far back and its blue vaults are covered with glittering crystals that reflect the lights in magnificent brilliancy.

There are hundreds of known caves that have never been fully explored and no one can conjecture what may yet be found in them. Hardly a year passes without the discovery of new ones, each with its own peculiar interest.

Of all the largest known caves, the Mammoth cave of Kentucky has been the most extensively explored and yet the end of many of its passages have never been reached. Wind Cave, in the Black Hills of South Dakota, has three thousand rooms already discovered, varying in size from a bedroom to three acres in extent. It derives its name from the unexplained fact that a terrific wind sometimes blows out of the cave and again into it.

GRAND CANYON.

The Grand Canyon of Arizona, through which the Colorado River runs, is commonly accredited with being the most magnificent scenery in the world. At some points the river is 6,000 feet below the observer on its shores, and the grand terraces cover a thousand square miles. The observer sees stretched out before him gorges and mountains of white, red and black, mingled with varying shades of color. It is stated by scientists that this awful gorge was cut out alone by the action of the stream of water, and the time taken to do this constitutes an age or era in the geological history of the earth.

NIAGARA FALLS.

The world's wonders include nothing that appeals more strongly to the poetic imagination than the great cataract of Niagara. The flow of water is 275,000 cubic feet a second, and the force is estimated to be equivalent to that of 8,000,000 horses. Certain power companies have been given concessions to utilize this force under limited conditions. One has cut into the river a mile above the American falls with a canal twelve feet wide leading to a wheel pit thirty feet wide by 200 feet long, and 180 feet deep, having a force of 100,000 horse-power, and by the use of turbines giving a capacity of 40,000 horse-power. These turbines are 70 inches in diameter and have 36 blades, each 142 inches square.

Horseshoe Falls is 600 yards in breadth, with a fall of 154 feet, and is thrown about 50 feet from the base of the cliff. Goat or Iris Island, 75 acres in extent, divides this from the American falls.

GREATEST WATER FALLS IN THE WORLD.

The greatest cataract in the world has now been discovered. It is a waterfall

so far surpassing Niagara and the Zambesi falls in size, grandeur and volume that the marvel is it has not been heard of before, although it is concealed in an impenetrable forest, 1,000 miles by boat from the nearest large city. This newly discovered wonder of the world, which has now cast Niagara and Victoria into the shade and will be for all future time the premier waterfall of the earth, is situated on a river dividing Brazil from Argentina. It is called the Falls of Iguazu. The finding of it is the greatest discovery of the twentieth century.

Iguazu is sixty feet higher than the falls of Niagara, nearly three times greater in width, and its volume of water is 60 per cent larger. This newly-discovered cataract is more than twice the width of the celebrated falls of the Zambesi. More than half as much water again goes over the Falls of Iguazu as over the Zambesi Falls, which have often been claimed as surpassing Niagara in size, though not equaling it in beauty. The Falls of the Zambesi are 100 feet higher than the Iguazu cataract, but the gigantic size and enormous volume of the latter so far surpass those of Zambesi that the two are not in the same class.

It is claimed—and apparently with truth—that both Niagara and Victoria Falls are far excelled in grandeur, beauty and sublimity by the Falls of Iguazu.

That a cataract twice as big as Niagara should exist today unknown to the world is a statement of the most startling character. Apparently it is inconceivable that a natural wonder of this kind should exist anywhere on the earth without mankind having heard of it long ago.

A general idea has spread abroad during the last few years that there is nothing great left to uncover, that the big discoveries of geographers have all been made, that the unexplored portions of the earth have all been explored, that there are no longer any dark continents, no new marvelous spectacles, and no further lessons to be learned.

The day of the discoverer and explorer has not passed. There are vast tracts of earth whose contents are still unknown to the world.

No more august spectacle has the eye of man rested upon than this mighty river, twice as big as the Niagara, hurrying to the sea with incredible swiftness and tumbling 28,000,000 cubic feet of water per minute over a precipice 210 feet high.

Higher waterfalls than this exist in plenty. But they are mere trickling rivulets compared with the giant volume of the Iguazu. In our own western country and in Switzerland considerable streams are shot over the edge of a precipice so high that they actually disappear and never reach the ground except in the form of light spray blown hither and thither by the wind. Waterfalls of this character a thousand feet high are by no means uncommon.

But what makes Niagara great is its volume of water. If you can realize the meaning of 18,000,000 cubic feet of water per minute falling a distance of 150 feet over a precipice 5,260 feet wide, you begin to understand just why Niagara is the marvel it is to the whole civilized world. As a matter of fact, Niagara and Victoria Falls on the Zambesi are almost identically alike in size

and volume, but the latter exceeds Niagara somewhat in height. There is, in fact, a very close resemblance between the two greatest cataracts in the world, which occupy a class by themselves.

Now, when you consider that the volume of each (which makes it great) is 18,000,000 cubic feet per minute and that the volume of the newly discovered Iguazu Falls is 28,000,000 cubic feet per minute, or 60 per cent larger, you then begin to realize what a stupendous cataract Iguazu must be.

Reflect that Iguazu is over one-third again higher than Niagara. On top of this bear in mind that the width of the cataract of Niagara is 5,249 feet and that of Victoria Falls 5,580 feet, while that of the newly found Falls of Iguazu is 13,123 feet. Iguazu is therefore 60 per cent greater in volume and more than 100 per cent greater in size than either Niagara or the Falls of the Zambesi.

The newly-found cataract is nearly 3,000 feet greater in width than Niagara and Victoria combined.

Incredible as these statements may seem, they are authenticated in a manner which puts them beyond question. They are the result of observations by a body of expert engineers and are officially put forward as facts, and are vouched for by the government of Argentina.

A MOUNTAIN OF SOAP.

In a mountain near Elko, Nevada, there is an inexhaustable supply of pure soap. One may enter the mine with a butcher's knife and cut as large a piece as he wants. It is beautifully mottled, and on being exposed to the air hardens somewhat. The mountain of clay is of fine texture, and it contains boracic acid, soda, and borate of lime.

Its color is given it by the iron and other minerals. In its natural state it is rather strong in alkali, and removes ink and other stains readily. At one time it was used in all the lavatories on the Pullman cars, but as soon as this fact became generally known the cakes were carried away by travelers as souvenirs. The railway company could not supply the demand, so it was forced to discontinue its use.

MIRAGE.

Wherever the air lies in strata of different densities, the mirage may be seen. This is especially true in arid regions. It may be from reflection, as when the layer of denser air acts as a mirror, or from refraction, as when it changes the rays of light in a manner similar to clear water, or from the projection of a shadow, or from looming. Looming is a form of mirage where the air acts as an enlarging lense. Objects thus appear nearer and larger, as may often be seen in fogs.

The spectre of Brocken is a famous example of shadow projection. This is seen from the peak of Brocken, the highest elevation in the Hartz Mountains in Hanover. The setting sun throws the shadow of the visitor upon the eastern sky in a most gigantic form, the enormous image distinctly reproducing every movement. The Fata Morgana is an awe-inspiring mirage seen in the Strait of Messina, where the observer on shore can see images in the air, sometimes in the water, of men, ships, and cities, so distinctly as to seem impossible to be a deception.

These are mirrored reflections from the objects at places invisible to the observer.

The Arctic regions are favorable to fata morgana scenes from the rugged ice-fields, which the imagination of the beholder easily converts into the most sensational and romantic visions of undiscovered people and cities in the unexplored regions about the north pole.

GREAT BONES.

Giants lived in ancient times, but they were not men. Our forefathers found bones of antediluvian monsters and were certain that they had discovered the remains of ancestors of fabulous size and age.

Cuvier found parts of skeletons that could have belonged only to monster beasts thirty or forty feet long, weighing many tons. He gave the first comparative study of these things that have resulted in making a very probable scientific guess at the appearance and habits of those gigantic animals.

The plesiosaurus was a sea-lizard with a neck that looked like a serpent, paddles like a whale, a tail like a kangaroo. The horned dinosaur had a length of twenty-five feet, with a body like an enormous rhinoceros. The armored dinosaur was fully thirty feet in length, with great fan-like hinged scales, usually erect along his backbone, the largest of which had a surface of two square feet. The brontosaurus was not less than sixty feet in length and weighed probably more than twenty tons. Its feet made a track one square yard in extent.

The atlantasaurus was not less than eighty feet in length and twenty-five feet high. A thigh-bone from this monster has been found in Colorado measuring six feet ten inches in length and weighing 500 pounds. The pterodactyls were like bats, and one species is known, from the impression of its form left in clay that became rock, to have a spread of wing not less than twenty-five feet. In the fossil deposits of Kansas, there have been found the skeletons of sea serpents eighty feet in length, and in Wyoming an animal like the hippopotamus known as the tinoceras, whose body measured over twelve feet, with a weight of not less than three tons. The great mammoth, double the size of any living elephant, has been found frozen in the ice of northern Siberia, fully preserved as at the day of its death. According to geologists it had lain there 10,000 years. This animal appears to have roamed all over the world.

New Zealand has furnished us with the bones of the bird Moa whose skeleton is twelve feet in height. Its egg is fourteen inches in diameter and contains two gallons.

The largest bird now on earth is the ostrich and the largest flying bird is the condor. The condor presents some unexplained problems to scientists. Darwin writes that he once watched with a powerful field glass a condor soaring at a great height for half an hour and not once could he see the slightest movement made by wings, pinions or the body of the bird. Theories are at fault to account for the great distances through which it can discover its food. It rarely rests below the snow line of the mountains, but a newly slain animal thirty miles from its living place will be visited by several of these birds before an hour has passed.

LARGEST ANIMALS.

The largest animal of any class is the finback whale of the Atlantic ocean within the temperate zone, which sometimes attains a length of 100 feet. The largest fish is the shark of the Indio-Pacific region, which grows to a length of seventy feet. The largest bird is the ostrich, which sometimes stands eight feet high and weighs 350 pounds. The largest reptile is the salt water crocodile of Australia and southern Asia: it may measure thirty feet in length.

THE DEEP SEA—ITS FREAKS AND MONSTERS.

At the depth of a mile it is absolutely dark, the temperature is just above the freezing point, there is no perceptible movement of the water, and the pressure is almost incalculable. Fine, soft mud covers the bottom. There is no plant life and the little variety of animal life is very peculiar. Scientists calculate that the pressure upon every square inch is twenty-five times greater than required to drive an ordinary passenger train. As this pressure diminishes toward the surface, the deep-sea animals are in constant danger, so to speak, of falling upwards. Nature has provided for this, however, in the compactness of its cells, and, as long as the animal stays in the places that harmonizes with its structure, it is enabled to retain its equilibrium.

SCIENTISTS AND THE SEA SERPENTS.

The earliest historical record of a sea serpent dates back thousands of years. Thus Livy tells of an extraordinary serpent one hundred and twenty feet long which, during the Punic wars under Atilus Regulus, had its lair on the banks of the River Bragados, near Ithaca, and is said to have swallowed many soldiers, and to have kept the army from crossing the river. Being invulnerable to ordinary weapons, it had finally to be attacked with catapults and other military engines, such as were used in those days against fortified towns. Its annoyance did not cease with its death, for the water became so polluted with its gore and the air with the noxious fumes from its decaying carcass that the soldiers had to remove their camps a very considerable distance away. They, however, secured the creature's skin and enormous skull, which were preserved in a temple at Rome till the time of the Numantine War. From that time to the present almost countless reports have been made, some in extensive circumstantial detail, witnessed often by numerous persons of unimpeachable reputation, concerning the discovery of these monsters of the deep.

The latest and by far the most authoritative account of the observation of a sea serpent was made only a few days ago by the officers and crew of the French warship Decidee on the Indo-Chinese station. They saw the monster in the Bay of Along, near Haiphong.

A GREAT MONSTER.

In his report to the Admiral the commander says: "I was standing on the bridge when my attention was directed to a round, dark mass in the water, about 300 yards to port. I took it to be a rock, but, on seeing it move, presumed it was an

enormous turtle, four or five yards in diameter.

"Soon afterward it rose out of the water, and by the undulatory movement that followed I saw that I was in the presence of an enormous sea monster shaped like a flat-bodied serpent of about a hundred feet in length.

"It appeared to have a soft, black skin covered with marble spots, and the head, which rose about sixteen feet out of the water, closely resembled that of an enormous turtle with huge scales. It blew up two jets of water to a height of about fifty feet.

"It moved slowly through the water at a speed of about eight knots, and when about 150 yards from the gunboat plunged beneath it like a submarine, reappearing on the surface about 400 yards away.

"I had meanwhile given orders for the port barbette gun to be loaded with shrapnel, and when the monster arose we gave him a broadside. This, I thought, would be a surer method of reaching the serpent than with a solid shot.

"Whether or not any of the shrapnel struck the creature I cannot say. It certainly did not appear to have the slightest effect. The serpent merely turned its head at the sound of the report, sent up two great sprays of water from its nostrils and headed for the open sea.

"It would have been my intention to overtake and either kill or head off the serpent, driving it in towards shallower water, but that was impossible. Two more broadsides were sent after the serpent, which continued to rapidly increase the distance between it and the Decidee. These shots did not appear any more effective than the first one, leading me to believe the creature was provided with either scales or skin of such toughness that the pieces of shrapnel which struck it glanced off harmlessly.

"A number of the officers and crew also watched the monster, which gradually disappeared from view."

Curiously enough, Lieutenant Lagresille, one of the officers of the gunboat, while cruising in 1898 off the same coast in the gunboat Avalanche, met with a similar experience.

Lieutenant Lagresille was in command of the Avalanche at that time. In his official report made to the French Navy Department he declares that on one July day of that year he saw in the waters of the bay two great swimming creatures, twenty metres long and two or three in diameter. He could not go into particulars at that time, for, with the instinct of the hunter, he immediately took a shot at them at a range of 600 metres, whereupon they sank under the water and did not appear again. On the 15th of the following February, however, while again crossing the bay, he saw a pair of the same creatures, possibly the same individuals, and gave chase for an hour and a half, firing at them from time to time. Once, he is sure, one of the creatures was hit, but the ball glanced off harmlessly.

The chase was eventually given up for the reason, as Lieutenant Lagresille explains in his report, that the sea serpent had greater endurance than the Avalanche. But he had time to make some observations. The animal was gray in color, and it seemed to him that it had many flippers. On this point scientists

agree that probably it had only four, but that they moved too rapidly to be counted. It swam with an undulatory movement in a vertical plane, its body not being rigid like that of a whale, but extremely flexible.

With these particulars and other facts of an equally positive nature, which have been collected from time to time, it has been possible for scientists, both here and abroad, to complete a very satisfactory description of the modern sea serpent and to trace his ancestry back through the ages to the plesiosaurs and other monster forms of marine life, the fossilized remains of which have been found from time to time.

EVIDENCES GIVEN TO A FRENCH SOCIETY.

The French Zoölogical Society has received a report from Professor Emile G. Racovitza, of the Arago Laboratory, who has collected indisputable proofs of the sea serpent's existence, in which he declares that the megaphias magaphias is actually abundant in the region on the coast of Tonkin which bears the general name of the Bay of Along.

"It cannot be doubted," Professor Racovitza declares, "that the capture of the great sea serpent would be an important scientific exploit, but this, as we have seen, is almost impossible to hope for with a merchant vessel or a warship with its ordinary armament. It will be much more useful and just as interesting for these sorts of ships to approach the animal as near as possible and make photographs and sketches. The very worst thing to do is to shoot it on sight, because it probably keeps on the surface only by swimming and will sink like a hump-backed whale when killed. Attack it, therefore, only in shallow water or with a harpoon gun. Supposing that the creature should venture into a shallow harbor, the proper tactics are to approach it slowly in a concentric curve, as quietly as possible, to a distance of a half mile or so, and then make the direct attack cautiously in a small boat.

Individual reports made by officers and men of the French gunboats Avalanche and Decidee and of the French ship Bayard, all of whom saw one or more of the sea serpents, agree in saying that the monster's head was very like that of a seal, only many times larger, of course. When the serpent came up after diving it blew water high in the air as a whale does; the only difference being that the water spread like a cloud of spray instead of spouting straight up like a jet. The officers of the Bayard distinctly saw a crest along the serpent's back. This is believed to have been a mane. The blowholes through which the creature also breathed were very wide apart. An average of about ten minutes seemed to elapse between inhalations.

ANCESTOR OF THE SEA SERPENT.

The plesiosaur, which roamed the seas during the jurassic period, has been recognized as one of the modern sea serpent's mightiest and most formidable prehistoric ancestors. Several species of this monster of the deep are known to science, and specimens have been found ranging from dwarfs of twenty feet in length to full-grown types which must have measured in life at least seventy-five feet from nose to tip of tail.

In this particular monster the tail had not developed to any great extent. In

fact, comparatively speaking, it was extremely short. This was because the plesiosaur relied more upon its four enormous paddles than its tail for propelling power. These paddles were from seven to fifteen feet long, and placed far back. This accounted for the short tail and very long neck.

The plesiosaur's head was relatively small, being not more than eight feet long. Its most distinguishing features were the elongated snout and the double rows of conical teeth, each one foot long and inserted in a distinct socket.

As regards the habits of the plesiosaur, Dr. Conybeare, the distinguished English scientist, has arrived at the following conclusions:

"That it was aquatic is evident from the form of its paddles; that it was marine is almost equally so from the remains with which it is universally associated; that it may have occasionally visited the shore, the resemblance of its extremities to those of the turtles may lead us to conjecture. Its movements, however, must have been very awkward on land, and its long neck must have impeded its progress through the water, presenting a strong contrast to the organization which so admirably fits the itchthyosarus to cut through the waves."

THE SEA SERPENT A LAND ANIMAL.

As the respiratory organs of the plesiosaur were such that it must of necessity have required to obtain air frequently, it has been naturally concluded by Dr. H. Alleyne Nicholson, professor of natural history in the University of St. Andrews, Edinburgh, "that it swam upon or near the surface, arching back its long neck like a swan, and occasionally darting it down at the fish which happened to float within its reach. It may, perhaps, have lurked in shoal water along the coast, concealed among the seaweed, and raising its nostrils to a level with the surface from a considerable depth, may have found a secure retreat from the assaults of powerful enemies; while the length and flexibility of its neck may have compensated for the want of strength in its jaws and its incapacity for swift motion through the water."

Returning to the sea serpent of modern times, it is interesting to note the many points of similarity between the creature seen recently in the Bay of Along, and the sea serpent which formed the subject of an official report to the British Admiralty from Commander McQutae, of the English warship Daedalus, in 1848. The ship was homeward bound from the East Indies and about ten miles northeast from St. Helena when this serpent was sighted.

"The commander and his officers were startled by the sight of a huge marine animal," the official report reads, "which reared its head out of the water within twenty yards of the ship. The head was like a runbuoy, about eight feet in diameter. It had a scroll or tuft of loose skin encircling it, about two feet from the top. The water was discolored for several hundreds of feet from its head."

In an extremely interesting little book entitled "Sea Monsters Unmasked," by Professor Henry Lee, formerly naturalist to the Brighton Aquarium, England, the author goes fully into the history of the

Sault Ste. Marie Canal. This is the largest ship canal lock in the world. The canal is owned by the government. It is 7,000 feet long with the least width of 108 feet. The lock is 515 feet long, between the gates, eighty feet wide, and forty feet deep.

sea serpent, at the same time expressing his firm belief in the existence of sea animals of great size.

"Only a few years ago," he says, "any one who expressed his belief in the existence of a sea serpent or other marine monster formidable enough to capsize a boat or pull a man out of one was derided for his credulity, although voyagers had constantly reported that in the Indian seas they were so dreaded that the natives always carried hatchets with them in their canoes with which to defend themselves from attack by these creatures.

"We now know that their existence is no fiction; for individuals have been captured measuring more than fifty feet, and some are reported to have measured eighty feet in length.

"As marine snakes many feet long and having fin-like tails adapted for swimming abound over an extensive range, and are frequently met with far out at sea, I cannot regard it as impossible that some also may attain to an abnormal and colossal development. Dr. Andrew Wilson, who has given much attention to this subject, is of the opinion that in this high development of ordinary forms we discover the true and natural law of the production of the giant serpent of the sea. It goes far, at any rate, toward accounting for its supposed appearance. I am convinced that, while naturalists have been searching among the vertebrata for a solution of the problem, the great unknown, and therefore unrecognized, calamaries, by their elongated cylindrical bodies and peculiar mode of swimming, have played the part of the sea serpent in many a well-authenticated incident.

DESCRIPTION OF THE ANCIENT SEA SERPENT.

"The similarity of such an animal to the plesiosaur of old is remarkable. That curious compound reptile, which has been compared with 'a snake threaded through the body of a turtle,' is described by Dean Buckland as 'having the head of a lizard, the teeth of a crocodile, a neck of enormous length, resembling the body of a serpent, the ribs of a chameleon, and the paddles of a whale.' In the number of its cervical vertebræ—about thirty-three—it surpasses that of the longest-necked bird, the swan.

"The form and movements of this ancient saurian agree so markedly with some of the accounts given of 'the great sea serpent' that Mr. Edward Newman has advanced the opinion that the closest affinities of the latter would be found to be with the enaliosaurians, or marine lizards, whose fossil remains are so abundant in the East Indies and Chinese waters."

STORIES FROM ANNAM.

There is an endless series of sea serpent tales among the natives of Annam.

"The dragon did it!" is a kind of stock excuse among the natives. If a pig boy lose—or sell—half of his herd, he will say that the dragon did it. If the cattle of a native farmer get into the plantation of a European by night, it is the dragon that has tramped down the crop. * * * The dragon is on the Annamite flag, as it is on that of the Chinese. * * *

It is true that enormous footprints are sometimes seen on the shore of the Bay of Along. They are five times as big as the footprints of any elephant. And they look more like handprints than footprints!

They were photographed two years ago by an unprejudiced and curious Frenchman at the time when a dragon story occupied the French court of Hai Phong.

Here are the facts. Hong Hai, on the shore of the bay, is an important port on account of near-by coal mines, which have been for some time doing a good business. Hong Hai grew rapidly and there was naturally a lot of building.

Among the builders was a Frenchman named Vasseur, and it was he who built the first European apartment houses. He built two of them, six stories and a mansard, each on a corner opposite the port, on the very shore of the bay.

On the evening of September 13, 1901, the two fine apartment houses stood completely finished.

On the morning of September 14 both were in ruins.

They had fallen inward, in masses of brick, mortar, iron and wood.

Vasseur, the builder, brought a suit in the French court at Hai Phong against the native contractor for furnishing bad material and negligent work. And now comes the queer part.

The contractor pleaded in court:

"The dragon pushed the houses down."

And the extraordinary thing was that he could bring up twenty native witnesses to the fact that "the dragon," coming from the bay by night, did do the damage.

"What is the dragon like?" asked the judge.

"Everybody knows what the dragon is like," answered the witnesses. "Look at the flag."

"On the flag he has legs. Has the dragon legs?"

"Sure he has legs."

"A long tail like a serpent?"

"Yes."

"A long neck?"

"Yes."

"He must be big to push a house in," said the judge.

And here the natives stood mute. The story was laughed out of court by the superior Europeans and the native contractor was cast in damages.

But the European who photographed the mysterious footprints on the sand has always said, "What creature made those footprints?" The insinuation that they were made by the native contractor to back up his story is not satisfying.

Were the tracks made by an iguanodon?

The iguanodon has arms and legs and can walk upright like a man. Or are there both the plesiosauruses and iguanodons in the infernal bay of Along? Native tales tell of outrageous battles between dragons on that coast by night.

That there is something in it is acknowledged by the pundits of the French academy. The French navy is discussing plans for investigation. One of these days shortly you will see an expedition going out to capture one of the sea serpents of the bay of Along, iguanodon, sanlodon, ichthyosaurus, plesiosaurus, mosasaurus.

FLOATING ISLANDS.

Mexican lakes are prolific in floating islands. They are, in fact, floating gardens, with crops of beans, peas, potatoes, etc., and gay with varied flowers. "There are two sorts of them," says Humboldt, "the one in movement and driven about by the winds, and the other fixed and attached to the shore." The origin of these Chinampas, as they are called, has been traced back to the fourteenth century. They are partly natural and partly artificial. Masses of tangled vegetation collect together in the water, and when these natural rafts become strong enough soil is placed upon them. Thus they become floating gardens. The movable ones are towed or pushed with strong poles from place to place.

METHOD OF CONSTRUCTION.

On one of a group of such islands may be seen the cottage of the guard. In Humboldt's time it was one of the sights to see the boats laden with vegetables and flowers grown on the Chinampas coming down the canals to the cities of Istacalco and Chalco. The promenade around the lakes among the floating islands was one of the finest to be had in the environs of Mexico. A more recent traveler, Brocklehurst, also describes these floating gardens of Mexico. The lakes were covered in parts by tangled masses of reeds, water plants and bushes. As soon as one of these masses was strong enough, strips of turf were laid upon it. This was done several times, and then some soil laid on the surface. It was now a garden, and yielded crops of vegetables and flowers. At the time of the Spanish conquest thousands of them were to be seen on the lakes. A large part of the revenues of the Astic kings came from the cultivation of these floating gardens. They were from 100 to 200 feet long, and from 20 to 100 broad. Long willow poles were driven through them into the bottom of the lake, there to take root and keep the island anchored.

The floating islands of the Chinese fishermen are also interesting. These are towed after the boats as they sail or row over the lakes and rivers. The intense economy of the Chinese mind makes every square yard of soil profitable, and here is a striking illustration. Making a raft of bamboos and interweaving it with reeds and long grass, the fisherman then covers it with soil. On this floating island he grows his onions and other vegetables, towing his garden after him as he follows his vocation up and down the river or lake. The Nile has its islands of floating vegetation. Sometimes the White Nile is entirely blocked by an enormous number of floating islands. They are largely made up of the famed papyrus. Sometimes a hut is to be seen ensconced in a corner of one of them.

OFTEN IMPEDE NAVIGATION.

Navigation is often impeded by their accumulation. The River Angara, which runs out of Lake Baikal, has many islands floating on the bosom of its rapid current. Some are wooded, others low and treeless, like green blotches on the surface of the stream. On Lake Dal, in the Vale of Kashmir, are floating islands moored to the bottom by stakes. Other lakes

also have their floating islands. Humboldt, indeed, remarks that they are to be met with in all zones. Darwin saw them in Chile during the memorable voyage of the Beagle. Lake Tagua-Tagua, for example, is noted for its floating islands. They are formed of the entwined stalks of dead plants, among which living vegetation takes root. They are circular in form, and from four to six feet thick. As the wind blows them about, these islands frequently pass from one side of the lake to another. Horses and cattle are thus sometimes carried across the lake—a unique kind of ferryboat is seen in action.

On the broad waters of the Ganges, Amazon, Congo and Orinoco, islands of matted trees float down and put forth on a perilous voyage over the ocean.

MISSISSIPPI CONTAINS ISLETS.

The Mississippi, "Father of Waters," bears such green islets on its bosom. On one of them, perchance, young trees take root, and the pistia and nuphar adorn it with their yellow flowers. Alligators, serpents, and birds seek the shelter of its seclusion. But they have embarked on a voyage from which there is no return. They are carried out to sea and finally perish when the island sinks water-logged to the bottom. Travelers ascending the Amazon in a canoe meet its floating islands going seawards. On one, perchance, a group of grave-looking storks regard in stony silence a party of chattering monkeys. Another carries a flock of ducks and divers sitting by a party of squirrels; while a third floats down a crocodile and a tiger cat. When a party of four tigers was landed at Montevideo from one or more of these floating islands, the inhabitants were greatly alarmed. Wafted by the wind in its trees one of these islands may finally reach the shores of some uninhabited land, newly risen, it may be, from the deep. Its varied passengers alighting may colonize the new land, while its freight of seeds may spring up to cover it with vegetation. Many curious and anomalous facts in the distribution of plant and animal life, to account for which naturalists have been lavish in their creation of continents, may perhaps be more simply explained in this way. In other cases the floating island of matted timber may sink water-logged to the bottom, and help to form a seam of coal.

INTERESTING TO GEOLOGISTS.

The floating island is an object of interest to the geologist, and has been duly chronicled in Sir Charles Lyell's "Principles." The most notable example in this country is the well-known floating island of Derwentwater. And it is a specially remarkable one. A stranger, indeed, "did never float upon the swelling tide." It is only visible at irregular intervals, and this is, perhaps, the most curious point in its history. Every now and then it puts in an appearance, and then vanishes again for a space of from one to five years. A hot summer seems to favor its appearance, and its favorite months are July, August and September. It floats, but at the same time remains attached to the bottom by its sides. Hence it is unable to travel over the lake as some other floating islands do. The explanation of this curious and erratic specimen is probably as follows: At the bottom of the lake is a felted mass of vegeta-

ble matter in a state of decay. The resulting gases inflate a part of the mass and raise it to the surface. The floating island of Derwentwater, in fact, is a large bubble, of which the skin is matted vegetation, rising from the bottom of the lake. As the gas gradually escapes, it sinks again to the bottom.

ISLANDS THAT RISE AND DISAPPEAR.

Islands that pop up unexpectedly are impelled to such doings by volcanic disturbances under the sea. Off our own shores, in the neighborhood of the Aleutian chain, a remarkable phenomenon of this kind has been under observation for a long time. Two lofty mountains, called Bogislof and Grewingk, have lifted themselves out of the ocean, and having slowly grown to great size, now are gradually disappearing. It is evident that before long they will vanish altogether, and only a blank expanse of ocean will remain where once they loomed gigantic in the pathway of ships.

The history of these two islands is well-known, though it covers more than a century. In 1778 Captain Cook, the famous navigator, sailed directly over the place they now occupy, and nothing was there; but on May 1, 1796, something happened. A great darkness fell upon the Aleutian chain, and in the midst of it a mighty fire rose out of the ocean with a terrific roaring sound. Stones were hurled as far as Umnak, thirty miles distant, where severe earthquakes were felt. At sunrise on the following day the quakes ceased, and the flames diminished. The mists cleared away, and it was seen that a new island, still smoking, had made its appearance, black in color, and in shape like a pointed cup.

The island grew steadily both in height and circumference, until at length it was three miles around and nearly five hundred feet high. It kept on smoking, and the sea in its vicinity seemed to be boiling hot. Nobody dared to approach it, however, and some venturesome sea-lion hunters who landed upon the rock eight years later, in 1804, found the ground so warm that they could not walk upon it. It then was observed that there were many small craters, from which quantities of stones were being thrown. Bogislof (as the Russians called the rock) is in much the same condition today as in 1804, except that it has cooled off somewhat and has diminished in size, owing to the disintegrating action of the elements. It now is not more than two-thirds its original height; but volumes of steam still are given off from fissures in its sides.

In the summer of 1883 there was another convulsion, and shrouded in steam and fog another volcanic island was born, half a mile away. It was first seen by Captain Matthew Turner, on September 27 in that year, and was active in eruption, throwing out masses of lava and ashes, and emitting volumes of smoke and steam from the apex and numerous fissures. Thus came into being the island of Grewingk, or New Bogislof, which for a long time was connected with old Bogislof by a sort of isthmus of sand. The first landing upon it was made in May, 1884, by the officers of the revenue steamer Corwin. It was found to be about eight hundred feet high, though since that time it has shrunk to less than

seven hundred feet. As late as 1890 the roar of the escaping steam from its craters was so tremendous that all other sounds were drowned to the ears of anybody within a mile's distance. It still manifests symptoms of vigorous volcanic activity.

Geologists believe that thousands of years ago a crack in the earth's crust was opened under Bering Sea, and that lava poured forth, forming a submarine mountain. In 1796 a fresh eruption caused Bogislof to rear itself above the surface, and in 1883 another one produced Grewingk; but both of these rocks stand upon one great mound beneath the ocean and after awhile they too will disappear.

BOOK VIII

Extraordinary Affairs

AND

Conditions Among Mankind

WITH THEIR

INFLUENCE AND RESULTS UPON THE PRESENT PROGRESS OF CIVILIZATION

A SURVEY OF THE ANOMALOUS AND ABNORMAL EXPERIENCES OF MANKIND, WITH REFERENCE TO THEIR BEARING UPON THE CONDUCT OF LIFE

Paying off old scores. Manchurian bandits attacking Russian officers.

Extraordinary Affairs and Conditions Among Mankind

THE JAPANESE.

THE first Japanese quality to be recognized by the western world was taste. Mr. Kipling, traveling through Japan and with rough hands and muddy boots recoiling before the Japanese merchant, apostrophized that merchant thus:

"You are much too clean and refined for this life below and your house is unfit for a man to live in till he has learned a lot of things which I have never been taught. I hate you because I feel inferior to you."

The Japanese has a way of manicuring his nails before he goes into battle. He also has a way of writing poems like an Athenian while he is toughening his fibre by exposure to the weather like a Spartan. His gardens, his vases, all the things that make life an art and a pleasure in itself, have caused the western world to look with dubious but enlightened eyes at its jammed, crammed conservatories and at its profuse, tangled mantelpieces. Is it better for us that Japan should be able to teach us something or that we should have the glory of having no superiors in anything?

STUDY AND DESIRE FOR IMPROVEMENT.

"I have seen scores of persons with spectacles," said Kipling, "whom it were base flattery to call soldiers. Their officers were as miserable a set of men as Japan could furnish, spectacled, undersized, hollow backed, and hump shouldered. They squeaked their word of command and had to trot by the side of their men to keep up with them."

Where did those officers get their spectacles? Reading books which the officers who fought the Boers had never seen.

The efficiency which is conquering Manchuria was based on a belief in knowledge. Did Germany have a laboratory in which chemicals for commerce and for war were handled in a way not yet known in Japan? A Japanese enrolled himself among the students of that laboratory. Did Chicago have a new method of canning beef? A Japanese with spectacles arrived on a sight seeing tour.

Knowledge as a preliminary to action —the whole recent history of the Japanese shows their profound belief in this principle.

COURAGE, PHYSICAL AND MORAL.

When the western world had granted the Japanese taste and knowledge it still hesitated to grant them courage.

"I would give a good deal," said Mr. Kipling, "to see them blooded on an equal number of our native (East Indian) infantry. If they have pluck, and there

is not much in their past record to show that they have not, they ought to be first-class enemies. Under British officers, instead of the little anatomies at present provided, they should be as good as any troops recruited east of Suez."

do. And they probably construct no philosophical defense of suicide after capture. They simply feel tumultously that they wish they were dead with their brothers in arms rather than alive among their enemies with food in their stomachs

JAPAN OPENS ITS DOORS TO THE WORLD.

Commodore Perry meets the Japanese Imperial Commissioners at Yokohama in 1853. "The rudimentary treaty he made was little more than a covenant to supply wood and water to needy ships, and to be merciful to their crews."

Criticism now runs the other way. The Japanese are reproached for wanting to die. They don't care about their wives and children. They set no more value on life than savages. They charge machine guns like fanatics, and when they are captured they beat out their brains against stone walls like children. They

It is a feeling worth a few suicides to any nation.

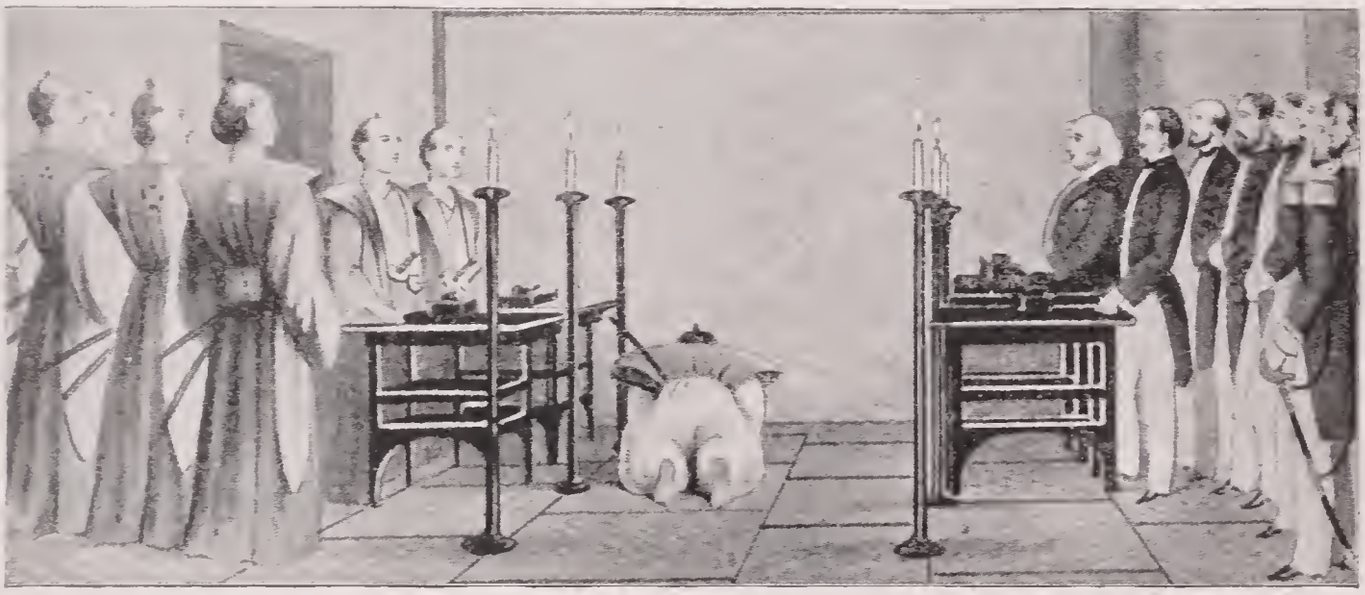
SURRENDER OF SELF TO COUNTRY.

This is after all the supreme Japanese characteristic.

There are Japanese who went to Eur-

ope, studied in the European laboratories, laid the foundation of extensive personal reputations, and are now working in the Japanese government laboratories with no more glory than if they were labeled No. 126 or No. 253.

Love, as well as ambition, yields to patriotism. The Japanese wives love their husbands. But they love Japan more. So when their husbands are conscripted they put out flags and are envied by their neighbors.



JAPAN OPENS THE DOOR TO GREAT BRITAIN—1858.
The interview between the Earl of Elgin and the Prime Ministers of Japan. "He hastened the entry of the Land of the Rising Sun into the family of nations."

It is a law of the biological world that disconnected cells are lower than organisms in which a multitude of cells are subordinated to an inclusive whole. The empire of Japan is such an organism. The Japanese is a mere cell. And in being a mere cell he attains higher than if he lived to himself.

THE LESSON TO THE WORLD.

The Japanese have their faults. Only their virtues have been mentioned here, because it is their virtues that will raise them and raise the world.

If the Japanese were uncouth, ignorant, cowardly, and unpatriotic there would be no talk about the yellow peril, and the western world would be invited to repose on the lotus bed of superiority. As things are, the western world is invited to resent the proved fact that the Japanese have taste, knowledge, courage, and love of country to so preëminent a degree as to make us feel uncomfortable. We ought to be grateful to the Japanese for making us feel uncomfortable. The manifest destiny of the yellow peril is not to subdue the western world, but to improve it. Thank heaven there is one more nation worthy to share the burden of this planet's future!

The Japanese have learned from us. If we are as wise as they we can learn some things from them. Taste, knowledge, courage, patriotism—are not the Japanese sending an electric current through the

nerves that nourish these things in the bosom of every man in Europe and in America?

THEIR HOME LIFE.

"Queer Things About Japan" gives this accurate account of its home life: "The Japanese have no bread, no beds, no fires, no boots and shoes, no trousers for the men, no petticoats for the women, both sexes wearing instead several dressing gowns one over the other. In their houses they have no windows, no doors, no walls, no ceilings, no chests of drawers, not even a washing-stand, and the wardrobe is only a lot of boxes piled one on top of another. In the kitchen they have no range, no pots, no pans, no flour-bins, no kitchen tables.

"But then, they have no tables or chairs in the drawing-room, and in the real native house the drawing-room itself is only a lot of bedrooms with their walls taken down. There is no reason why you should find anything in a Japanese house except mats and a charcoal brazier, for warming your fingers and the teapot, and committing suicide. These and a cushion or two, and a quilt to sleep on, with an elaborate conventional politeness, constitute the furniture of a Japanese house, except the guest chamber. The articles in the guest chamber consist of a screen, a kakemone, and a flower vase.

"The Japanese have no forks, no spoons, no tablecloths; they have no sheets, no wineglasses, no tumblers. The Japanese young lady carries in her sleeve a pocket handkerchief, which is generally made of paper, a gaudy silk case containing her chopsticks—you take your feeding tools with you to a Japanese meal instead of finding them on the table—and another gaudy silk case containing a looking-glass, which is not made of glass at all, but of silvered bronze, her pocket-comb, which is of no use, but a piece of foreign swagger, and her pot of lip-salve, which is not intended to soften the lips, since kissing is not a Japanese custom, but to color them to improbable crimson.

"She may keep her fan and her smoking materials in her sleeve, but she more often has them suspended from buttons. The Japanese do not use buttons for buttoning; they stick them through their sashes and let them hang down by silver chains or silken cords, to the other end of which they attach their fans, their smoking outfits, their medicine chests, and their pen and ink.

"They carry their tobacco in a purse, and smoke it in a little brass pipe hardly big enough to hold a cigarette."

OTHER PECULIARITIES.

He mounts his horse on the right side, and, when he stables him, backs him in tail first and feeds him from a tub at the stable door. He hauls his boat on the beach stern first; he prints his books with the footnotes at the top of the page, and the word "finis" where we put the title page. In addressing his letters he puts the name last and the town or country first; he says "east-north" and "west-south" where we say "north-east" and "south-west"; his keys turn in instead of out; he drinks his wine before and not after his dinner; and when he wants to be specially polite he removes, not his head-covering, but that of his feet.

THEIR MORAL IDEAS.

It has been stated that the Japanese have no morals, but this is quite untrue. They have no moral ideals, so cherished by western civilization. The beauty of the moral principle—right for right's sake—is quite incomprehensible to the Japanese mind. In the Japanese philosophy it is right to do anything which is wise, and wrong to do anything which is foolish: beyond this there is no right or wrong, good or bad.

In business the Japanese is honest when honesty is the best policy, and dishonest whenever it seems advisable. The merchant who does not take advantage of an opportunity to cheat by giving short weight or substituting an inferior quality of goods considers himself a fool. The man who does not break his plighted word if it is advantageous for him to do so is stricken by his philosophic conscience. I do not think that there is a foreigner doing business in Japan who will not bear testimony to these facts, which are freely admitted by the Japanese among themselves, although they will be indignantly denied as a matter of policy by Japanese abroad. Foreign firms doing business in Japan have always experienced the greatest difficulty in preventing their Japanese employees from defrauding them by secretly exacting a commission from the native merchants with whom they transact business. It is a matter of common knowledge that the native "bantos" or head men of the oldest foreign firms have enriched themselves by the fraudulent practice of charging a secret commission or "kosen" in all dealings with native merchants. Many of these "bantos" have amassed millions by their dishonest methods, and the business of the foreign firms that employed them has practically passed into their hands, the foreign partners in those firms being mere salaried employees of the Japanese "banto." It is a fact that this is the condition of one of the principal American export houses in Japan today. Dishonest collusion between the native merchant and the "banto" has wrecked many a foreign firm in Japan.

PERSONAL CHASTITY.

To the Japanese mind personal chastity is a matter of no importance except in the wife and mother. This attitude is consistent with the inborn philosophy that dominates the Japanese character. The interests of the home and posterity make it necessary that the wife should be virtuous, and in justice to the Japanese wife it must be said that she is a model of virtue. If the husband can find happiness in being a libertine, or in keeping a number of concubines, it is considered right for him to do so. It is only when the husband squanders more than he can afford in riotous living that he is considered to be doing wrong. The principle upon which a libertine husband is condemned in Japan is purely a material one and not a moral one. A young girl may be bonded to a brothel, a geisha company, or placed as a concubine by her family, if financial reasons make it advisable, and to the Japanese mind it is perfectly proper. The Buddhist doctrine of self-sacrifice upholds the girl who sells herself for the sake of her parents, and although she becomes for the time being an outcast from society, she is esteemed for her act. It often happens that a well-to-do

Japanese man buys a girl out of the Yoshiwara, and if she becomes his wife she finds no difficulty in establishing herself in society.

Suicide has always been considered honorable in Japan, the wish to die being considered sufficient justification for the act. No moral principle against suicide is apparent to the Japanese mind. In past generations the samurai code prescribed suicide if it was impossible to live with honor. The passing of the samurai has not witnessed the elimination of his fantastic theories concerning suicide in Japan. The cause of suicide in Japan is almost invariably dishonor. To the Japanese mind there is no sin but folly, no ideals to be realized but material and patriotic ones.

IDEAL OF A PERFECT WOMAN.

Kesa filled the eighteen requirements of a beautiful woman. Moreover, she was peerless in character as well. Before her and her lover-husband, Wataru, life seemingly stretched a long, happy road. Unfortunately they fell in debt to Morito, a neighboring samurai, whose evil eye fell upon Kesa, and he coveted her with all his soul. He wished Kesa for his wife, but while Wataru lived this could not be with honor. But an enemy's life was but a small hindrance—one stroke of the keen samurai sword and Kesa could be free. So Morito reasoned, and pressed this plan upon Kesa's old mother, who in turn pleaded with her daughter, till Kesa found herself between two fires, filial versus conjugal love and duty.

At last after bitter weeping she consented and plans were laid. On a certain night Wataru would return from a journey and after his bath would lie down on his own pallet among the sleeping ones in the family hall. Morito could easily find him, for his hair would be wet from the bath.

On the appointed night Morito crept through the hall, lit only by the andon's dim light. He found Wataru's place; his hair was wet and his face muffled in the covering. Hasily he spread down a napkin by the pillow, then with one sharp, swift stroke of his sword severed the sleeper's head. Gathering it up in the napkin he fled. There was no pursuit, and when he had gained his own room in safety he sat down to gloat over his prize. As he turned the head to get a good view the sight froze him with horror, for it was the sweet, piteous face of Kesa. She had sent her husband far from harm, cut off her hair and prepared it to imitate his and meekly lay down to die that she might be true to both ties—dying, she fulfilled her duties as a filial daughter and a faithful wife. In those stern and cruel times many women had done excellently, but Kesa outshone them all.

JIU-JITSU, THE ART OF GENTLE CONTROL.

Jiu-jitsu, or "the art of gentle control," is by no means to be confounded with an ordinary form of wrestling or mere feat of strength. This art, which is the result of study and practice during the feudal regime that prevailed in Japan for nearly 800 years, is a peculiar method of weaponless defense and offense, embracing an extensive field and involving profound principles. Jiu-jitsu, in its practical aspect, constitutes not only a warfare, a system of physical training or athletic sport, but

an ethical culture which amounts almost to a practical philosophy. Under the feudal regime the most rigorous moral system, unsurpassed even by that of the Stoic school, was enforced upon, and gradually accepted by, the Samurai, the military retainers of the feudal clans, who found in jiu-jitsu the most efficacious means of defense against an unwarranted assault upon both their body and their honor.

These ancient Japanese warriors carried with them two swords, keen-edged, formidable weapons, which they prized highly as "the soul of the Samurai"; but it was considered unbefitting their rank and dignity to unsheathe them at an unworthy assailant. The code of honor of the Samurai required of them to dispel a villain's attack, even an armed one, without weapon; and thus it came that jiu-jitsu was used as a means of punishment and defense.

WEAPONLESS WARFARE.

That this peculiar Japanese method of weaponless warfare was originally intended as a defense rather than offense becomes clear when one considers that it generally gives the advantage to the seconder over the initiate in a contest—so it is that in almost all the forms of jiu-jitsu contest it is the beginner who gets the worst. The moral feature of jiu-jitsu is shown by the fact that it leads the defeated contestant to a state of complete control without inflicting any injury. The punishment thus inflicted is termed "submission," that is, a position of utter helplessness, from which the victim is unable to regain power even at the risk of life or limb, the only alternative left to him being in his opponent's mercy.

In an actual case, where one's life or death is concerned, this "submission" process may be carried to the extreme, ending in a permanent injury or death. Otherwise, the pain imparted and the fatality threatened by the process serve to force a prompt surrender. The holds for this final act in a jiu-jitsu contest are so taken as to give the greatest effect with the least possible exertion, that is to say, in it the well-known mechanical principle of the lever is exemplified. It will be readily seen that one who exacts a "submission" needs not be necessarily a powerful man. Indeed, he can bring under his control an opponent of far superior strength.

The efficiency of jiu-jitsu in actual combats or as a means of self-defense needs scarcely be emphasized; but to the credit of the experts in this art it may be noted that they have proved superior to all professed to have attained in other crafts, even that which resorts to weapons. Many cases are on record in Japan in which an accomplished jiu-jitsu Samurai dispelled a sword attack delivered from the hands of a skilled fencer.

VITAL TOUCHES.

Jiu-jitsu has a "weapon" in the form of ate-mi, or "vital touches," which may be administered with the thumb, the clenched hand, the elbows, the toes, the edge of the hand, or even with the head. The effects of these "touches" range from a temporary paralysis of the arm to the complete suspension of vital processes and instant death. The methods of dealing these fatal acts have been kept se-

cret, and even today it is only after thoroughly ascertaining disciples' moral character that the instructor imparts to them these dangerous "secrets." The location of the "death points" upon the human body is seldom disclosed to the disciples. The use of the "vital touches" is prohibited, except where one's life or death question is involved, and even then a morally trained jiu-jitsian would consider it beneath his dignity to resort to them unless attacked simultaneously by several of the enemies.

MORAL SELF-DEFENSE.

The moral aspect of jiu-jitsu is again shown in the humane treatment given to the victim when the "vital touch" is dealt upon; for the "secret" part also includes the methods of recalling him to life. Katsu, or "vivification," is imparted to the students at the same time they are given the dangerous "secrets." It con-

Japanese officer entering Pingyang, riding an ox led by a soldier.

sists in the administration of an act without the assistance of any object or person other than the hands of the one who dealt the fatal "touch." This restorative act, of course, implies a profound physiological and anatomical knowledge.

As to the effectiveness of this jiu-jitsu treatment, the claim may be advanced that not only the victim of the "vital touches," but those of untimely accidents who suffer in a similar manner and who might otherwise be abandoned as beyond human help, may be successfully treated by the "vivification" methods, provided they have not received permanent injuries to the vital organs. The apparent death caused by strangling, for instance, may be treated without much difficulty by a jiu-jitsian of average skill, and the chance is that ninety-nine out of every hundred may regain life otherwise given up. Of all the forms of apparent death caused by the administration of the "vital touches," that which is induced by carrying the strangling, or "neck wringing" hold to the extreme, is easiest to be "vivified" and with the certainty of leaving no trace of permanent injury. This process, therefore, is generally employed in giving demonstration of "vivification."

A PECULIAR FEATURE.

The most peculiar feature of jiu-jitsu is perhaps the fact that in it the physical strength is least considered. Although the possession of strength is not a disadvantage, the striving too hard, especially by the beginner, is to be avoided. In jiu-jitsu the secret is "to turn the opponent's exertion into one's own advantage." This is the obvious result of the application of mechanical laws and strategic means.

The reason why jiu-jitsu enables "the weaker to overcome the stronger" is, of course, given by the application of the mechanical laws and strategies. But this is not all. For it was chiefly by the development of the art of nori, literally "riding," that this result has been assured. Nori is the way of "tumbling" or landing the body when it is tossed or thrown. In short, it is the "way to be defeated." The methods of jiu-jitsu combats into which this nori is introduced are called sutemi-waza, that is, the means by which one can win by "giving himself up." In other words, sutemi-waza is the method of achieving ultimate victory by inviting an initial defeat. It is one of the most formidable means known in jiu-jitsu; and it may be asserted without reserve that one may apply this means with an opponent twice his strength and promptly bring the opponent to the ground.

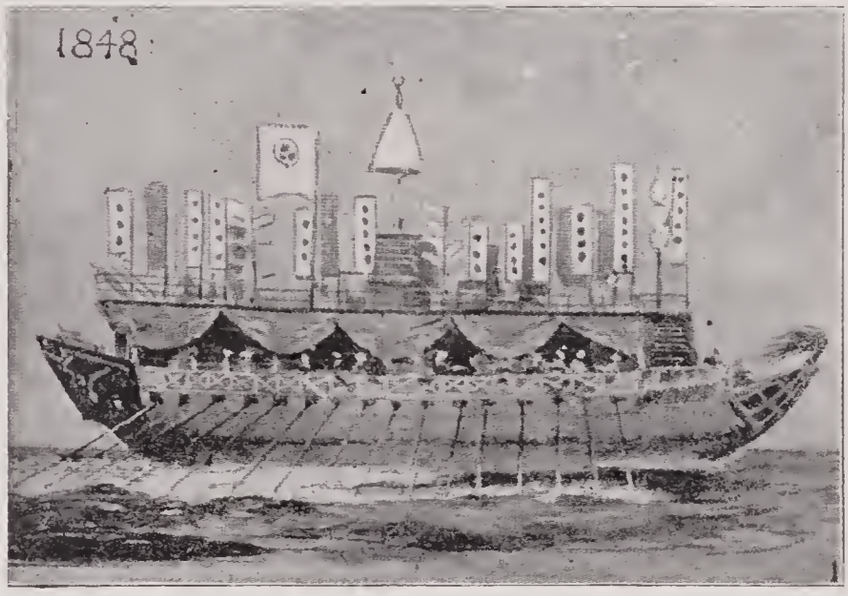
In regard to physical training, jiu-jitsu has a unique advantage, since it may be practiced by all persons, regardless of sex, both old and young, strong and weak. No such exertion as invariably required by an ordinary feat of strength is called for in jiu-jitsu; nor does it necessitate such violent exercise as to injure those having the tendency of heart disease, provided one chooses one's equal for an opponent.

Jiu-jitsu is adapted for all those who desire to have a strong, healthy body, coupled with a vigorous, sound mind, and, above all, that agility of movement and keenness of senses which enables a person to protect himself in face of danger generally.

A REMARKABLE EXERCISE OF SKILL.

As sport, jiu-jitsu is unsurpassed by anything else. Not counting the pleasure that ensues from the spirit of rivalry, the contest does not cause fatigue and is perfectly safe, provided no dangerous "vital touches" are permitted. In a formal contest it is no humiliation to meet a toss or throw or to be brought to a "submission" position. A toss or throw is often invited on the part of contestant in order to release himself from a disadvantageous grapple, and it does not always decide a contest. When brought to a "submission" position, prompt surrender will bring no harm. The customary signal for "submission" is given by knocking with the free hand on some portion of the opponent's body or on the floor, and when the signal is given it is to be made a strict rule that the opponent should at once release the holds.

For pleasure, as well as for jiu-jitsu practice, nori, or the "tumbling" exercise, may be recommended. This exercise may be taken up alone. It is to fall the body on the floor in any manner and in a position enabling the limbs to be used most readily for striking the floor. The feature in this exercise lies in the skill required for creating a reaction or rebounding from the floor as one falls, thus counteracting the impact of the fall and saving the body from the shock. This is easily learned by practice. The striking on the floor is to be done with the hands or feet at the moment the main part of the body is about to touch the floor.



War galley of Japan in 1848.

SUICIDE IN PREFERENCE TO CAPTURE OR DISHONOR.

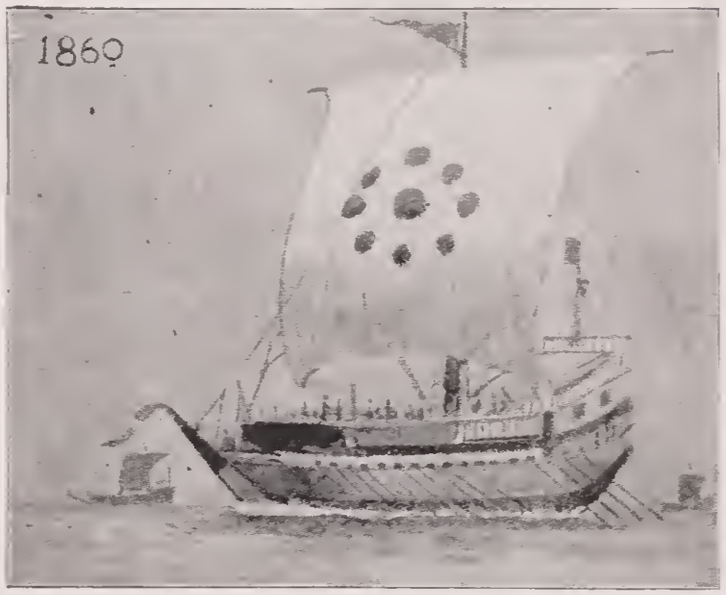
Prince Jaime of Bourbon, son of Don Carlos of Spain, who is serving under the Muscovite flag in Manchuria, relates in a letter recently received that after one of the attempts to bottle up Port Arthur, when he steamed out in a launch to rescue several Japanese who were clinging to the rigging of the fireships sunk in the

roadstead, the men one after another blew out their brains with their revolvers, or ripped open their stomachs with their knives, throwing themselves into the sea rather than permit themselves to be taken prisoners. In the graphic accounts of the sinking of the Japanese transport Kinshiu Maru, on April 25, off the Corean coast by the Vladivostok squadron, it is related how the troops on board, several hundred in number, having refused to surrender, and having resisted with rifle fire an attempt to board the ship, committed suicide while the vessel was being torpedoed.

The officers and a number of the men who belonged to the Sumurai class destroyed themselves by means of hara-kiri, that is, by cutting the stomach open with their swords or knives, while the others, presumably of a lower order in the social scale, either blew out their brains with their rifles or shot one another. This took place on deck in full view of the Russian fleet, and it was not until a third torpedo had been fired that the sinking of the Kinshiu Maru put an end to the extraordinary scene. Several of the soldiers who had been plunged into the sea by the foundering of the vessel, not having had time to kill themselves, were dragged on board a boat on which the English officers of the transport had sought refuge, and as no attempt was made by the Russians to molest them, they reached land in safety. As soon as possible they notified the military authorities at Gensan of the fate of the transport and asked permission, now that they had accomplished the duty imposed upon them of supplying information, to follow the example of their comrades and to destroy themselves, declaring that all the troops on board, when they found their ship surrounded by the Russian fleet, had taken a solemn pledge to kill themselves.

TROOPSHIP CAPTURED BY RUSSIANS.

The story of the death of the troops and of their officers on board the Kinshiu Maru sent a thrill of admiration throughout the entire Japanese nation, served to give a timely inspiration to the army in



War galley of Japan in 1860.

the field, and was construed as a silent but eloquent assurance that Japan could trust her honor to the keeping of her soldiers. It was felt that they had rendered a service to their country by the national spirit shown in the manner of their death —the death by hara-kiri, which the princes, great nobles and Samurai of Japan have, for eight hundred years and more, preferred to dishonor. Some years ago a project was brought forward in the legislature of Tokio advocating the abolition of the practice of hara-kiri, or seppuku, as it is more commonly called in Japan. In the debate which followed it

was described as "the very shrine of the national spirit and the embodiment in practice of devotion to principle," as "a pillar of the constitution," as "a pillar of religion and a spur to virtue," and as "one of our most valuable and time honored institutions," and the motion was defeated by the overwhelming vote of 205 to 3. Ono Seigoro, who proposed the measure, was murdered not long afterward.

Hara-kiri may not be in consonance with our Western ideas. Indeed, the survival of this form of self-destruction in Japan serves to remind us of the fact which we are so often tempted to forget —namely, that between the Orient and the Occident there is a great and deep gulf, and that whereas we belong to the Occident the Japanese will always remain Asiatics, no matter how many of our ways they may adopt. Hara-kiri is not a pleasant custom, and by many it will be denounced as savoring of barbarism. And yet, underlying this particularly ghastly method of suicide, there is an underlying ideal of chivalry and of honor, without which the world would be poorer.

PRESERVING HONOR BY SUICIDE.

The notion that it is possible to preserve by means of suicide honor that would otherwise be forfeited is, however, by no means confined to Japan, though it is the only country in the world where hara-kiri prevails. Thus in China princes, great nobles and mandarins of the highest rank, if they are considered by the Empress Dowager as meriting death, are permitted to put an end to their lives by means of strangulation or poison, thus escaping the infamy of decapitation. In Turkey and other Mohammedan countries dignitaries whose death is desired by their rulers are accustomed to receive from the latter, with much ceremony, the gift of a silken bowstring, to be used by them for the purpose of strangulation, and even on the Continent of Europe the officer or noble when struck or otherwise insulted by his sovereign or by a prince of the blood, and who is debarred by the rank of his assailant from seeking satisfaction by means of a duel, is required by unwritten law to blow out his brains as the only way of preserving intact his honor. For a blow or an insult unavenged is considered among the higher classes in most of the Continental countries of Europe as disqualifying a man from any further association with the people of his caste, and as entailing the most cruel species of ostracism.

THE AWAKENING OF CHINA.

The Chinese empire is beginning to wake up from its long sleep of the centuries. Inoculated, under protest, time and again with Western ideas, only to reject them violently, it is at last beginning to develop an unmistakable desire for closer trade relations with the great outside world.

One of the most significant signs is the manner in which the volume of its purchases from other nations has steadily increased. From inconsiderable dimensions

ten years ago it reached last year the enormous total of $400,000,000. It is fair to assume that at the present rate of increase another decade will have seen this amount trebled, perhaps quadrupled. In population and natural resources the empire is vastly richer than Japan. Only the alertness and the enterprise has been lacking to make it overreach that little nation, which in 1902 enjoyed a foreign trade of $270,000,000. With the proper influences turned loose in China—and all indications point favorably in this direction—it should soon overcome the big handicap held by its more strenuous neighbor.

The realization of the vast trade possibilities in awakened China is the animus of the persistent efforts of European powers to partition the empire for the establishment of "spheres of influence." Russia, Germany, and France have been particularly active in this respect, although the latter two had been compelled to resort to diplomacy in place of arms. Russia has taken advantage of its close proximity and its intimidation of Chinese officials to build the Siberian railroad and imperceptibly creep forward, inch by inch, in its occupation of Chinese territory. It is probable that the European powers did not know the extent of Russia's holdings in Corea and Manchuria until the sharp challenge of Japan precipitated the present war.

POLICY OF THE NATIONS.

The "open door" policy, which has been consistently advocated by the United States government, sometimes assisted by Great Britain, is diametrically opposed to that of the "spheres of influence." The latter contemplates that certain portions of the empire shall be absolutely allotted to certain nations, with an implied trade monopoly which may be enforced by "policing" or any other method of coercion. The "open door" gives all nations free entrance into all parts of the empire, with an honest, impartial competition the only restraint to trade. Thus the commercial emissaries of the United States, Great Britain, France, Germany, Spain and other powers would be on an equal footing in every portion of the empire. No nation would have the privilege of cramming its products down the throats of the celestials within rigid geographical divisions, irrespective of their quality or price in comparison with those of other countries.

The merits only of the goods and salesmen would settle the success or failure of international commercial rivals. The manufacturers of the United States feel that their profits would be infinitely larger by the adoption of this liberal course than if they were given what may be vulgarly called a "cinch" or "graft" in a restricted Chinese territory. Knowledge of this sentiment has impelled our government to assume and maintain its firm stand for the "open door"—an attitude to which it compelled the European governments to subscribe, at least by implication, at the outbreak of the present far Eastern struggle.

The Mikado's advocacy of the "open door" is well understood and unequivocal, whereas the triumph of Russia would in all probability mean the enforcement of the greedy and unfair policy of "spheres of influence," if not a sweeping Russian monopoly.

THE YELLOW PERIL.

The population of China proper, without counting Manchuria, Thibet, and Turkestan, is estimated at more than 420 millions of inhabitants. A noted writer in Paris takes the startling view that this enormous mass would make first-rate raw material for an army, because the Chinaman is the same all over China. The difference of dialects—of which so much has been made by other writers—ends, he says, at a comparatively short distance away from the sea.

The Chinaman has an extraordinary vitality; he has a large family, partly, no doubt, because of the necessities of ancestor-worship, and he lives to a great age. Moreover, the Chinaman prospers quite regardless of climate, whereas the Japanese, for instance, have found it difficult to colonize Formosa because it is too hot, and Yesso because it is too cold. China is capable, therefore, of having an army stronger physically than those of all neighboring countries. The Chinese are splendid marchers, and get along very well on nothing but rice and tea. Moreover, the Chinaman has no nerves unless he is an opium smoker, and as this is rather an expensive vice, the classes which would supply recruits for the army are practically free from it. This absence of nerves not only simplifies the medical service, but also renders the Chinaman indifferent to personal comfort. It is not necessary to protect him from mosquitoes, from heat, or from cold, and he never forgets his drill when he has once learned it. Altogether he seems to be the most convenient soldier in the world, for he can sleep anywhere, and on anything, and at any time that it may be necessary for him to sleep. Public spirit and patriotism are practically unknown in China, though there have been of late years some symptoms of a change in that respect; the army, therefore, appears to the general mass of Chinamen to be a band of parasites which costs much and produces no effect. Fraud and dishonesty are very rife in all the public services of China, and it is usual for the dishonest to hide their embezzlements by arson. The Ministry of Finance at Pekin regularly catches fire every two or three years. On the other hand, curiously enough, in commerce the Chinese are rather remarkable for their probity.

It follows from all this that a Chinese army could be raised which would be a most potent military force, if it was commanded and led by officers who possessed the two gifts of imagination and accuracy, in which the Chinese are themselves deficient. With such an army they would desire concessions and expansion for their teeming millions, and the end no one could foresee.

OPINION OF THE METHODIST BISHOP OF TOKYO.

I do not believe that there is any yellow peril in Japan.

Japan has thrown her lot, once for all, with occidental civilization and it is impossible for her to go back. Four days before I left Japan the prime minister, Count Katsura, sent for me and said:

"I hear you are going to America very soon, and as you have been living in Japan nearly twenty-five years and are

acquainted with us and the many changes that have taken place in that time. I hope you will do what you can to correct one or two mistaken impressions that have appeared in American newspapers. One is the so-called 'yellow peril.'"

Count Katsura went on: "We are not of the same color as Americans and Europeans. We are as God made us, but our hearts are as white as those of Americans and Europeans.

"Four years ago, when the foreign diplomats and Chinese Christians were in danger at Pekin from the Boxers, the Japanese troops marched shoulder to shoulder with the soldiers of Europe and America to their relief.

"Our educational system is based on that of America. Civil and religious liberties are guaranteed by the imperial constitution to all people living in Japan, whether natives or foreign. Many of our leading men in the army, the navy and in civil service are Christians.

"There are thirteen Christian members in the imperial diet, and the speaker of the last house, elected by the diet, Kataoka Kenkichi, was an earnest Christian man. There are, by the way, out of 370 only thirteen of whom were Christians, and yet they elected this man their speaker, and his election was confirmed by the emperor. There are also Christians among the judges; Christians among the professors in the Imperial university.

"When war was declared some people thought it would be a war between paganism and Christianity, and between white and yellow.

"The prime minister and the minister for home affairs directed the leaders of Shintoism and Buddhism to instruct their followers that this was not a war of religion or of race, and that as the constitution guaranteed religious liberty to all, not one should be interfered with because of his belief."

NO RELIGIOUS ANTAGONISM.

The bishop in the Russian church has been in Tokio ever since the beginning of the war and is as free and safe from personal injury as if he was in St. Petersburg.

I have visited since last February many towns, varying in distance from fifty to 600 miles from Tokio and have been treated with the same courtesy as is given me in Boston.

There has been sympathy, confidence and friendship between Japan and America for fifty years, forming a triple court which cannot easily be broken. It was the persistent, but kindly pressure of Commodore Perry which persuaded the Japanese to sign the treaty of 1854 which brought her into the committee of the nations of the west.

I consider, therefore, that we, as Americans, have a great responsibility to the Japanese. It is acknowledged by the leading statesmen and educators in Japan that there has been a decided decadence in manners and morals among their people during the last forty years. The whole system of ethics has lost much of the power it formerly had and there is unquestioned decline in the power of Shintoism and Buddhism to impart a healthy moral tone to the rising generations.

Count Okuma, one of the greatest statesmen and educators of the day, and Marquis Ito, the late prime minister, who

is sometimes called the father of the constitution of Japan, have both, in public utterances, asserted that if Japan is to retain her place among the nations of the world, a religion is necessary, and of all religions they estimate Christianity to be the best. That Christianity is necessary to sustain strength and purify the life of the nation.

The total number of Christians of all denominations in Japan is less than 200,000 in a population of 45,000,000, and yet the spiritual and moral influence is more than one hundred times its numerical strength.

The proportion of charitable, philanthropic and educational institutions established by Christian missions and native Christians in Japan is as three to one of those of Buddhism and Shintoism.

The only college for the higher education of women in the empire was established less than five years ago by a Christian Japanese minister.

A PLEA FOR CHRISTIANITY.

Marquis Ito said a short time ago:

"The only true civilization is that which rests on Christian principles, and, consequently, as Japan must attain her civilization on these principles those young men who receive Christian education will be the main factors in the development of future Japan."

Count Okuma, in an address to university students, used this very significant language:

"We may say that, although as a nation Japan has benefited materially by the adoption of foreign methods and institutions, our moral progress has been by no means satisfactory. In fact, it is a question whether as a people we have not lost moral fiber as a result of the many new influences to which we have been subjected. The efforts which Christians are making in applying to the country a high standard of conduct are welcomed by all right thinking people.

"As you read the Bible you may think it antiquated, out of date. The words it contain may so appear, but the noble life which it holds up to admiration is something that never will be out of date, however more the world may progress. Live and preach this life and you will supply to the nation just what it needs at the present juncture."

A former member of the cabinet, speaking on this subject, said:

"No matter how large an army or navy we may have, unless we have righteousness at the foundation of our national existence we shall fall short of success. I do not hesitate to say that we must rely on religion for our highest welfare, and when I look about me to see upon what religion we can best rely I am convinced that the religion of Christ is the one most full of strength and promise for the nation."

RELIGIONS OF RUSSIA.

According to the latest available statistics, there are in Russia, in round numbers, 95,850,000 orthodox Greek Catholics, 12,150,000 Roman Catholics, 12,150,000 Mohammedans, 6,750,000 Protestants, 4,050,000 Jews, 1,350,000 United Church and Armenians, and 2,700,000 followers of other faiths. Contrary

to the usual understanding of the Russian situation, there has been no law requiring conformity to the orthodox belief, with the exception of the restraints laid on the Jews. The persecution that has been leveled at the dissenters has been as a rule the work of the local officials, although the holy synod has not been entirely innocent in this regard. The affairs of the Roman Catholic Church are entrusted to a collegium and those of the Lutheran church to a consistory, both settled at St. Petersburg. Roman Catholics are most numerous in the former Polish provinces, Lutherans in those of the Baltic, and Mohammedans in eastern and southern Russia, while the Jews are almost entirely settled in the towns and larger villages of the western and southwestern provinces.

In the orthodox church the Czar is the supreme head, with power to appoint to every office in the church, and to transfer and remove incumbents, limited only by the right of the bishops and prelates to propose candidates. Practically, however, the procurator of the holy synod, the ecclesiastical bureau of the government, has usurped many of the Czar's powers in church matters.

THE ICONS OF RUSSIA.

The universal use of the icon in Russia is almost beyond belief. That the walls of the churches are covered with them goes without saying; that there is at least one in every house we know; but of the thousands upon thousands of portable ones, usually made of metal an inch and a half to two inches square, carried about by soldiers, sailors, and peasants and people of all conditions, who take journeys, there is no accurate account.

Rudely cut and crudely painted pictures are set in wayside shrines along the length of the railways, and it fills the Occidental traveler with curiosity to see the Russian tourists pour out of the train at a solitary station and move in solemn procession to say their prayers on bended knee before some little shrine.

Occasionally on the Trans-Siberian Railway one meets an altar car, which is built like an ordinary coach without seats. One end contains the altar, before which candelabra are placed for the worshipper's candles, which he has either brought with him or bought at a near-by shop. The walls of the car are covered with icons, while a large one hangs above the altar. Here the worshippers prostrate themselves and often kiss the venerated token. The car is moved from place to place at stated intervals, as occasion seems to demand.

In the living room of every house and hut as well as in every cathedral in Russia there is to be found at least one icon or sacred picture of Christ, the Virgin, or some saint or martyr; in most private houses there are several, and in the cathedrals there are hundreds; but however many the individual may own, there is always to be found one token of this kind hanging across the northeast corner of the room, near the ceiling. Before it is suspended a tiny metal lamp of filigree and colored glass, in which the light is never allowed to go out.

It is a sort of shrine to which each

member of the family comes morning and evening to say his prayers. Visitors make their way to it to pay their devotions and call down blessings upon the house before they go to greet host and hostess.

ORIGIN OF SYMBOLISM.

The story of the origin, history, and symbolism of these pictures is curious, eventful, and wondrously interesting. The dictionary definition of an icon is, as any one may read, "an image or likeness in the Greek Church, mosaic or the like, especially one representing Christ or the Virgin or some saint or martyr, commonly regarded as miraculous either in its origin or power."

The dispatches in the daily papers told us not long ago that the most sacred image in Russia had been sent from the Traitzke Monastery to St. Petersburg, and that later it would accompany the Czar's army to the far East, in the belief that through its agency victory would perch on Russian banners.

This "most sacred image" is a representation of the Virgin appearing to St. Sergius. It is about a foot square and covered with precious stones—votive offerings. It is set in a handsome box frame, which is also set with valuable gems.

This icon has had a remarkable history. It has led a peripatetic life for many decades. It accompanied Alexis, Peter the Great, and Alexander I on all their campaigns. A silver tablet is attached to it enumerating the battles at which it has been present.

The Czar sent a letter to the Metropolitan of the Greek Church, who had the picture in charge, in which he recalled the overthrow of the Tartar hordes under its auspices, and recorded his belief that if it were with the army the Russians would in a like manner overthrow the Japanese.

The day before General Kuropatkin left St. Petersburg for the East he visited the cathedral to perform the most solemn rites of his Church. The Patriarch blessed him and held aloft the image of St. Sergius and the Virgin for adoration.

IMAGES USED AS CHARMS.

Vice Admiral Skrydloff carries with him several of the sacred images which were presented to him the day he left St. Petersburg. A peasant dressed in the skins of wild beasts separated himself from the crowd and handed the Admiral an image of "The Holy Virgin of Joy to the Afflicted," which is reputed to have miraculous power. St. Theodosius, the miracle-worker of Czermakoff, was next given him.

St. Seraphim is a modern icon. The saint lived and died in the 19th century, and received his canonization from the Czar only last year. He is enshrined as a miracle-worker in the church of Saroff, and thousands of people of all classes are making pilgrimages to the church for the purpose of offering up their petitions in behalf of their friends and relatives in the army.

The largest manufactories are at Moscow and Vladimir. In the latter province the entire population is engaged during the winter in the manufacture of the sacred pictures. Every week during the season great fairs are held, where hundreds of cartloads of lumber are bought

Gen. Kuropatkin, commander of the Russian army, from a photograph taken just before the battle of Liaotung.

for this purpose, 130 loads not being an unusual amount.

Some idea of the amount and importance of the icon trade in this vicinity may be had when it is stated that it is valued at $750,000 per year. The majority of them are sold at a nominal price, perhaps 25 cents a hundred at wholesale, but when the tourist comes to buy he pays several hundred per cent profit. The trade extends all over Russia and the Balkan Peninsula.

WORST CRIMINAL COLONY ON EARTH.

Sakhalin, an island of northeastern Siberia, is the colony to which all Russia's worst criminals are sent, and the very name of the island is barred in St. Petersburg, and there is little wonder at the taboo, when one reads of the conditions that exist there. Russia prides herself on not executing murderers, and sends them to this cheerful island, where they form a very noticeable proportion of the population, with other desperate characters, men and women, and not a few political offenders of gentle rearing and cultivated tastes. Once there, the convict, if of the worst class, is consigned to what is termed the "testing" prison; those with terms of from four to twelve years are placed in a "reformatory" prison, while those with shorter terms are treated, after a short sojourn, as "free commands." Promotion is from the "testing" to the "reformatory" jail, and thence to the "free command" division. Generally speaking, a third of each term is spent in each section. Even the expiration of a sentence does not bring absolute freedom. For six years the ex-convict must remain on the island as an "exile settler," and then, if he is in a position, which few are, to get away, he may go as a "peasant" to Siberia for another six years. Then if he is alive, and has the means, he may return to Russia. The arrival of the free wife of a convict will secure the release even of a murderer from prison, and he may thereafter live as a "free command." The choice of a female prisoner as a housekeeper by an "exile" operates in the same manner in her case. No marriage ceremony is performed. The women chosen by the officials, ostensibly as cleaners and seamstresses, remain in the "reformatory" prison.

With a population recruited in this manner, and with the constant escape of prisoners, who must have recourse to highway robbery and burglary as a means of livelihood, life in Sakhalin is far from being "a sweet dream of peace." Every one goes armed. In the towns the revolver is carried in the pocket in the daytime, and in the hand at night. In the country, a rifle is taken as an additional protection. No self-respecting woman goes abroad in the streets without an escort.

WONDERFUL FEATS OF INDIAN FAKERS.

DESCRIPTION BY A NOTED TRAVELER.

The two most interesting classes among the many kinds of priests, monks, and other people, who make religion a profession in India, are the fakers and nautch girls, both of whom are supposed to devote their lives and their talents to the service of the gods. There are several kinds of fakers or religious mendicants in India, about 5,000 in number, most of them being nomads, wandering from city to city and temple to temple, dependent entirely upon the charity of the faithful.

They reward those who serve them with various forms of blessings; give them advice concerning all the affairs of life, from the planting of their crops to the training of their children. They claim supernatural powers to confer good and invoke evil, and the curse of a faker is the last misfortune that an honest Hindu cares to bring upon himself, for it means a failure of his harvests, the death of his cattle by disease, sickness in his family and bad luck in everything that he undertakes.

Hence these holy men, who are the familiars of the gods, and are believed to spend most of their time communicating with them in some mysterious way about the affairs of the world, are able to command anything the people have to give, and nobody would willingly cross their shadows or incur their displeasure.

RELIGIOUS BEGGARS.

These religious mendicants go almost naked, usually with nothing but the smallest possible breech clout around their loins, which the police require them to wear; they plaster their bodies with mud, ashes and filth; they rub clay, gum and other substances into their hair to give it an uncouth appearance. Sometimes they wear their hair in long braids hanging down their backs like the queue of a Chinaman; sometimes in short braids sticking out in every direction like the wool of the pickaninnies down South.

Some of them have strings of beads around their necks, others coils of rope around them. They never wear hats and usually carry nothing but a small brass bowl, in imitation of Buddha, which is the only property they possess on earth. They are usually accompanied by a youthful disciple, called a "chela," a boy of from ten to fifteen years of age, who will become a faker himself unless something occurs to change his career.

The faker himself never begs; the gods he worships are expected to take care of him, and if they do not send him food he goes without it. It is a popular delusion also that fakers will not accept alms from anyone for any purpose, but I have considerable personal experience to the contrary. I have offered money to hundreds of them and have never yet had it refused. A faker will snatch a penny as eagerly as any beggar you ever saw and if the coin you offer is smaller than he expects or desires he will show his disapproval in an unmistakable manner.

The large number of fakers are merely religious tramps, worthless, useless impostors, living upon the fears and superstitions of the people and doing more harm than good. Others are without

doubt earnest and sincere ascetics, who believe that they are promoting the welfare and happiness of their fellow-men by depriving themselves of everything that is necessary to happiness, purifying their souls by privation and hardship and obtaining spiritual inspiration and light by continuous meditation and prayer.

Many are clairvoyants and have the power of second sight. They hypnotize subjects and go into trances themselves, in which condition the soul is supposed to leave the body and visit the gods. Some of the metaphysical phenomena are remarkable and even startling. They cannot be explained.

LEARNED FAKERS.

Among the higher class of fakers are many extraordinary men, profound scholars, accomplished linguists and others whose knowledge of both the natural and the occult sciences is amazing.

I was told by one of the highest officials of the Indian empire of an extraordinary feat performed by one of these fakers, who in some mysterious way transferred himself several hundred miles in a single night over a country where there were no railroads, and never took the trouble to explain how his journey was accomplished.

The best conjurors, magicians and palmists in India are fakers. Many of them tell fortunes from the lines of the hand and from other signs with extraordinary accuracy. Old residents who have come in contact with this class relate astounding tales.

A young lady at a hotel was incidentally informed by a fortune telling faker she met accidentally in a Brahmin temple that she would soon receive news that would change all her plans and alter the course of her life, and the next morning she received a cablegram from England announcing the death of her father. If you get the old resident started on such stories he will keep telling them all night.

Of course you have read of the incredible and seemingly impossible feats performed by Hindu magicians, of whom the best and most skillful belong to the faker class. I have seen the "box trick" or "basket trick," as they call it, in which a young man is tied up in a gunny sack and locked up in a box, then at a signal a few moments after appears smiling at the entrance to your house, but I have never found anyone who could explain how he escaped from his prison.

They will take a mango, open it before you, remove the seeds, plant them in a tub of earth, and a tree will grow and bear fruit before your eyes within half an hour. Or, what is even more wonderful, they will climb an invisible rope in the open air as high as a house, vanish into space, and then, a few minutes after, will come smiling around the nearest street corner. Or, if that is not wonderful enough, they will take an ordinary rope, whirl it around their heads, toss it into the air, and it will stand upright, as if fastened to some invisible bar, so taut and firm that a heavy man can climb it.

AN INCREDIBLE EXPLANATION.

These are a few of the wonderful things fakers perform about the temples, and nobody has ever been able to discover how they do it. People who begin an inquiry usually abandon it and declare that the tricks are not done at all, that

the spectators are simply hypnotized and imagine that they have seen what they afterward describe.

This explanation is entirely plausible. It is the only safe one that can be given, and it is confirmed by other manifestations of hypnotic power that you would not believe if I should describe them. Fakers have hypnotized people I know and have made them witness events and spectacles which they afterward learned were transpiring, at the very moment, five and six thousand miles away. For example, a young gentleman, relating his experience, declared that under the power of one of these men he attended his brother's wedding in a London church and wrote home an account of it that was so accurate in its details that his family were convinced that he had come all the way from India without letting them know and had attended it secretly.

I have never seen more remarkable contortionists than the fakers who can be found about temples in Benares, and frequently elsewhere. They are usually very lean men, almost skeletons. As they wear no clothing one can always count the muscles and bones through the skin, but their muscles and sinews are remarkably strong and supple.

They twist themselves into the most extraordinary shapes. The professional contortionists seen upon the vaudeville stage cannot compare with these religious mendicants, who give their exhibitions in the open air, or in the porticos of the temples in honor of some god and call it worship.

They acquire the faculty of doing these things by long and tedious training under the instruction of older fakers, who are equally accomplished, and they are actually considered worship, just as much as an organ voluntary, the singing of a hymn, or a display of pulpit eloquence in one of our churches. The more wonderful their feats the more acceptable to their gods, and they go from city to city through all India and from temple to temple, twisting their bodies into unnatural shapes and postures under the impression that they will thereby attain a higher degree of holiness and exalt themselves in the favor of heaven.

They do not give exhibitions for money. They cannot be hired for any price to appear upon a public stage. Dramatic agents in London and elsewhere have frequently tempted them with fortunes, but they cannot be persuaded to display their gifts for gain or violate their caste and the traditions of their profession.

A TRAVELER'S STORY OF THE MARVELS PERFORMED IN HIS PRESENCE.

"When in India I made the acquaintance of a juggler, who tried to instruct me in all his tricks. He said that it was imaginary on the part of the spectators, as he simply willed that they should see those things. Yet I, in common with Western nations, was too animalized, sensual and materialized by flesh eating and consumption of alcohol to retain or accept any deep spiritual teaching.

"The most exciting performance that he gave for my amusement was the converting of a bamboo stick into a native servant, who waited at table and supplied our wants. Afterward—in his absence—I tried it, and to my surprise the

same man was before me asking for instructions. I directed him to fill the chatties in the veranda with water from the well in the compound. This he proceeded to do. When he had filled them all to overflowing I requested him to stop. He, however, took no notice of me, and went on, stolidly, bringing in the water until, in my excited imagination, it seemed that the bungalow would be washed away. Finding that I could not arrest or stop his movements, he passing through me as though I did not exist, I drew my sword and lay in wait for him. I made a slash at him and apparently cut him in twain, when lo! there were two men bringing in the water, neither of whom could I restrain from doing so.

"I was completely out of my depth, when I heard a quiet laugh behind me, and, on turning, found it was my instructor, who held up his right hand and the two men disappeared, the stick resuming its place on the veranda; and, to crown all, there was not the slightest sign of any water having been brought in. I excitedly appealed to him for an explanation. He said he had been present all the time, having willed that he should be invisible to me, and that I should imagine myself to see and do what I thought had taken place. In order to prove it he asked me to step into the compound, and directed my attention to a large cavern, which I knew was not there before. As I entered a number of huge elephants and camels issued from it in a continuous stream, yet I could not touch one of them. They apparently passed over me as though I did not exist. He again raised his hand and the cavern and animals disappeared."

LHASA.

THE SACRED CITY OF BUDDHISM.

Lhasa is the sacred city of Buddhism, and two places in it have especial sanctity. One of them is the Great Cathedral, the true "Lhasa" or "home of the gods" in the city proper, and the other is the palace of the Dalai Lama, or the living incarnation of Buddha, about three miles to the west of the city proper. In the view of all Buddhists, the most interesting spot in the city is the sacred mountain of Potala, which is crowned with the enormous structures of the Dalai Lama's palace and the environing temples and monasteries. The so-called mountain is only about 300 feet high, and above rise the walls of the palace to a height of 180 feet.

Besides this temple palace, the Grand Lama has a summer palace about three miles to the southwest at Nor-bu Ling, a charming abode in the midst of a park. All pilgrims to the holy city pay their homage to the Dalai Lama, who receives the pilgrims every day. In the mornings the stream of devotees pours toward the sacred palace or the summer park, according to his place of residence at the time.

A HALLOWED SPOT.

Potala, the "Mountain of Buddha," has played a most interesting part in the history of Asia. For the past 1,200 years it has been the most hallowed spot in inner Asia. "When its shadow," writes Reclus, "is projected by the setting sun on the azure sky, all work ceases in the

city. The inhabitants gather in groups on the terraces, in the streets, and public places, casting themselves on the ground and raising a muffled evening song of praise toward the sacred shrine."

There is no regularity about the streets, which divide the city proper into blocks of many shapes. In this district are the houses, huts and shops of the common people. It can boast of only one important temple, and that is the Great Cathedral at its southwest corner. The street fronts not taken up by houses are chiefly occupied by shops, bazaars and markets of all kinds.

When the people go out to play or engage in the more formal acts of worship, they usually leave the city proper and resort to the temples or the pleasure grounds to the west or south of the city. Between the city proper and the palace of the Grand Lama are the government offices and the residences of the officials and other important and wealthy personages.

RESORT OF MONKS.

Lhasa is only a little town, containing scarcely more than 10,000 people. To be sure, the latest visitor, the Japanese Buddhist priest, Kawaguchi, who was there in 1903, speaks of Lhasa as a place of 70,000 inhabitants, but he undoubtedly included all the monasteries, some of which have 8,000 to 10,000 monks within their walls. These monasteries are situated in the environs outside the city. They are not now, as they formerly were, the refuges of asceticism, but are schools for the teaching of Buddhist theology to the Lamaite clergy. Lhasa, like the Thibetans, is very dirty, and there is little in it that will seem attractive to a native of the Occident.

Not till July, 1904, had there ever been any reliable accurate information regarding this forbidden city. At that date an English expedition under Major Younghusband forced its way into this, the only unknown region in civilization, demanding a commercial treaty and the rights common to modern nations.

HOW JEWS ARE CHANGING.

THEIR DIFFERENCES IN CUSTOMS NOTICEABLE AT NEW YEAR CEREMONIAL.

The celebration of the Jewish New Year 5665, on September 10, 1904, once more brings to mind the changes that are taking place in the manners and customs of the Jewish race in America, where the lack of any form of religious persecution is doing more to win the Jew from strict orthodoxy than all the cruel repressions of Europe could begin to effect.

The Jewish New Year is observed, in accordance with the injunction: "And in the seventh month on the first day of the month shall ye have a holy convocation: no servile work shall ye do; a day of blowing the cornet shall it be unto you." —Numbers xix, i.

The cornet mentioned in the Bible is the ram's horn, or "shofar," and is used in all Jewish synagogues on the New Year. In the orthodox synagogue the man who has this duty must be an exceedingly strict Jew. He must not have shaved his beard. He must not have

committed any offense which would bar him from this sacred office. If he has done such a trivial thing as smoking a cigar on the Sabbath, he would be barred.

When he is ready to blow the "shofar," he covers his head with the "tallith," a silken cloth, and takes his stand at the altar, beside the rabbi, and at certain places in the ceremony blows the solemn sounds. The congregation does not look toward him when the "shofar" is blown. This would be considered a sin. The man himself is so covered that his face cannot be seen. Only his hand holding the ram's horn is left uncovered.

But the man whose duty it is to blow the "shofar" in the reformed temple stands beside the rabbi, with bared head, and the congregation looks forward eagerly to the blowing of the ram's horn. In the orthodox synagogue the "shofar" is blown about thirty times, whereas it is blown but three times in the reformed.

In the orthodox church the rabbi must not shave his beard; he stands with a cap on his head and a "tallith" on his shoulders, similar to the one covering the head of the "shofar" blower. In the reformed synagogue the rabbi stands with uncovered head, dressed as is any other minister of the Gospel. The congregation has to sit on hard benches in the orthodox synagogue, while in the up-to-date reformed sanctuary finely upholstered seats, similar to those in theatres, are used.

AN UNKNOWN RACE AT THE SOUTH POLE.

Professor Carsten Borchgrevink, Scientist and Arctic explorer, says:

"As the North Pole is surrounded by water, so the South Pole, we know, is surrounded by land. This great Antarctic continent, probably twice the size of Europe, is, I am convinced, peopled with an unknown race of man and beast. This great sixth part of the world is full of wonders and enigmas, of strange animals, formations and people.

"New people, new civilizations, new religions, new developments await us—for that reason South Pole exploration is infinitely more important than the finding of the North Pole.

"The possibility of finding human beings on an antarctic continent is all important and fascinating enough to outweigh every and all arguments advanced in favor of North Pole hunting. The millionaire spending his money to discover the North Pole doubtless performs a great service to geography, but the man who risks millions to discover the sixth continent will do immeasurably more.

"Reflect on the possibilities of finding twenty, forty or even a hundred million human beings, of whose existence we never dreampt, who, since the earliest ages, were separated from the five other parts of the globe, even as we are separated from Mars.

"We know, or at least we think we know, something about Mars, but the continent surrounding the South Pole is wholly unknown, even in the realm of scientific speculation."

Professor Serviss, a scientist of most extensive learning, in commenting upon an inhabited Antarctic continent, says:

"There is one very extraordinary fact affecting the lives of these people (if there be such people), that may have

BEFORE PORT ARTHUR A SECOND TIME.

Marshal Oyama, commander of the Japanese field forces. Marshal Oyama directed the operations which led to the capture of Port Arthur in the Chinese War.

served to modify their physical make-up in a most remarkable way. Dwelling not far from the positive pole of the earth's magnetism, around which, as happens with the negative pole in the far North, play auroral lights and other manifestations of electro-magnetic energy, and being rendered during the night continually aware of these luminous radiations from the upper atmosphere, they may have developed senses unknown to us—electric senses, so to speak—recalling some of the powers of perception peculiar to insects and other lower forms of animal life.

"One hesitates to represent human beings with any sense organs not possessed by the men and women we know, and yet, since the influences above spoken of have continued to operate during untold ages, the law of evolution suggests that they may have developed corresponding physical functions. One has but to glance at the wonderful and grotesque forms assumed by certain birds and insects, contained in our museums, in order to perceive how perfectly without limit is the power of nature to evolve peculiar organs of sense, the purpose of which in some cases we can hardly conjecture. So the Antarcticans may possibly be provided, in addition to eyes, ears, noses, etc., with subsidiary organs suggested by the antennæ of insects, or the phosphorescent organs of glow-worms and other light-giving animals, and with these organs attached to their heads they may derive from the electricity of the atmosphere and the magnetism of the earth's crust physical impressions utterly beyond the range of our experience. The inhabitants of the deep sea differ radically from those of the surface waters, and in no respect more so than in the possession by many of them of a phosphorescent power, the ability to make light about them. The inhabitants of the Antarctic continent, if they exist, differ in their environment from those of other parts of the earth hardly less than the deep sea animals differ from mountain trout or Hudson River shad. And we must suppose that in their case, as in all other cases, nature makes proper provision for the differences. If Captain Borchgrevink, penetrating the Antarctic continent, should find there, when the long night prevailed, a people capable, through some modification of their physical organism, of producing that desideratum of practical science—light without heat, light akin to that of the glow-worm, the fire-fly and the deep-sea phosphorescent creatures—the discovery would hardly surprise the world more than that of the finding there of any people at all.

"The pole itself would be for the Antarticans the centre of interest on the earth. To it would be directed all their pilgrimages. We have not in all the world a form of universal interest to be compared with the South Pole as it must seem to a people dwelling round about it. It is the pivot of their heavens, the point where perpetual day lasts longest, the spot where they would be irresistibly tempted to erect a temple around which would be centred all the hopes, fears, and interests of their race."

NEW RACE OF MEN.

During the summer of 1903 a race hitherto unknown to students of ethnology was discovered by Dr. Roth, the Queensland protector of northern aborigines, and Mr. Charles Hedley, conchologist of the Sydney (N. S. W.) Museum. The home of this race is Mornington Island, which was visited by the two scientists in the course of a scientific tour of the Gulf of Carpentaria and the Wellesley Archipelago, at the southern end of the gulf. Mornington Island was discovered in 1802 by Captain Matthew Flinders while surveying and mapping out the gulf, but he does not appear to have landed there. The island, which has an area of less than forty miles, has hitherto been known only by name. Its soil is poor with extensive marshes, and it offers no temptation to settlers. There is plenty of brush and coarse forest, sheltering kangaroos and other animals, which afford the islanders ample supplies of food. These before-unknown islanders, who had never seen a white man previous to the arrival of Dr. Roth and Mr. Hedley, are supposed to be either a retrograde type or else a more primitive type of the Australian races. Their language is related to that of other gulf natives. The use of clothing is unknown to them. They do not make huts, as do the natives on the mainland, but simply collect heaps of grass and sleep on the ground with these heaps between themselves and the wind. Articles to be transported from place to place are wrapped in bark, baskets being unknown to them. Their only water craft are rude rafts, made of a couple of logs lashed together with some light weed and propelled by branches used as paddles. They are much behind the natives of the mainland in a knowledge of even the rudest aboriginal appliances. In their communal relationships they have a stringent system of tribal classification, intended to represent different degrees of consanguinity and to assist in preventing too close intermarriage.

SECRET SOCIETIES AND THEIR ORIGIN.

Out of nearly 300 existing secret societies in the United States there are hardly any which, in one way or another, may not be described as having descended from the Masonic fraternity, either by imitation, adaptation, by borrowing this or that feature or by paralleling it in one or more ways with respect to ritual or practice.

The story of how this has come about would form an interesting sociological chapter. No other feature of it falls more heavily on the attentoin than the fact that in the United States, the most democratic nation in the world, secret societies flourish more freely than anywhere else. No better evidence of it exists than that one-half of the Free Masons on the face of the globe are to be found in the United States, while ninety per cent of the Order of Odd Fellows are in America.

In no other land than this are there hosts of secret orders whose members may be found everywhere, wearing but-

tons or jewels bearing their insignia. We, as Americans—that is, some 6,000,000 of us—seem to have fairly run secret society mad.

SOME RAMIFICATIONS.

And, as it was started out to explain, it is merely a species of "Freemasonry," all the way down through the Odd Fellows, the Knights of Pythias, the Grand Army, the Red Men, yes, the Society of Tammany, the "A. P. A.," the college Greek-letter fraternities, the Royal Arcanum, the Woodmen, the Maccabees, the Foresters of several varieties, many of the labor organizations, even the Roman Catholic Knights of Columbus, as much if not more than the others, all the way through the 300.

Freemasonry itself, as it is known today, does not go back of the period 1717-1725. The remains of the Masonic (operative) guilds in England in the seventeenth century, just as are some labor unions here today, were secret organizations.

They have no "degree" beyond that which was imparted to the candidates for merbership, who received what was called the "mason's word," a grip and some rigmarole formulæ. In time, however, these societies became sociological classics, and men of rank were glad to receive an honorary membership, partly in response to the interest taken in investigating their antiquity, which was great, and because of their interest in the origin of a few alleged mysteries the guilds were said to contain.

JOINED THE CRAFT.

This was in the day when many British and other European savants, antiquarians and others were delving into Rosicrucianism, Gnosticism, cabalism, alchemy and the like, and when the philosopher's stone was an object of academic research, much as the lost fleece was alleged to be at an earlier date.

Among the well-known Englishmen who were prominent late in the seventeenth century as antiquarians was Elias Ashmole. He was made a member of one of the operative "lodges" of "Freemasons" and induced some of his friends to take an interest in what appeared to be one of the fads of that day. It soon became the popular thing for an English gentleman, and it was not many years before some of the effects of this exalted membership began to show themselves upon the ancient guild craft.

By 1717 there were remaining only four lodges in London, the rituals of which had been embroidered with the fancifulness of the antiquarian cult which had patronized the earlier operative "Freemasons" and it was from them, with the additional turrets and pinnacles placed upon that rudimentary Masonic edifice, as Ashmole and others found it, that Freemasonry comes down to us—that it went from England to the continent of Europe, to Scotland, Ireland, America and throughout the world.

ORDER REACHES AMERICA.

But it was when the three degrees, two of them superimposed with the host of so-called Scottish—but really French—adornments, reached the British colonies in America late in the eighteenth century that the work of propagation began which has expanded until there are here today more than 300 systems of little Free-

masonry, each with its signs, grips, passwords, its rituals, its legends, its lessons of virtue and morality and charity, its obligations, its symbols, insignia and all the rest.

Ashmole and his confreres and followers were not slow to superimpose upon the simple Masonic initiatory ceremonies much that was appealing to the mystics among the upper classes of their time, and to that fact was due, no doubt, the vogue that was secured to Freemasonry between 1660 and 1725 among the titled classes in the United Kingdom. From that it was only a step in forming Masonic lodges by British diplomatic attaches and by officers of the British army and navy at metropolitan centres throughout the world.

RITUAL OF MASONRY.

In the various Masonic lectures to this day the student may discover appropriations of not only old testament history and ethics, but of Pythagorism, gnosticism and modern philosophies. The rituals of the primitive three degrees have retained touches from the mediæval workingmen's guilds and the Roman builders, the third degree being unique by embodying an epitome of what are classed as the ancient mysteries, the Royal Arch degree —originally a part of the third degree— exhibiting much of cabalism, and the Scottish Rite, so-called, of Rosicrucianism, Templary, Maltaism and the Christian ritual. No especial reference to Knight Templary or to the Knights of Malta, as such, is needed, as those branches of the American Masonic rite are palpably borrowed from the alleged Scottish degrees or grades.

MODERN FREEMASONRY.

Just as the aristocratic Society of the Cincinnati, when formed by Washington and his generals at the close of the revolution, was followed and rivaled by a democratic patriotic organization, the various societies of Tamina, or Tammany, of which we have a relic in New York, and, unknown to many of its members, a progeny in the Improved Order of Red Men, so the spread of modern Freemasonry in England after 1725 was followed by the rise and growth of the more democratic Odd Fellows, the Druids, the Foresters and other "friendly" societies, all of which imitated the fraternal and charitable features of Freemasons, the King Solomon legend of the latter giving way to that of David and Jonathan for the Odd Fellows, to the traditions of the Druids and to the romance woven about Robin Hood and Friar Tuck for the Foresters.

So it has been in nine out of ten of the secret society parallels all along down the line.

The leaders among the 300 or more living secret orders lend themselves as descendants of Freemasonry to a classification into three groups.

1. Occult and philosophical, the latter including the fraternal Greek letter or college societies.

2. The "friendly," and, drawn from them, the mutual benefit assessment orders which are so popular as furnishing a cheaper form of life insurance or "protection."

3. Specialized secret societies, some of them utilitarian; organizations seeking specific objects other than devotion to charity and fraternity, as such, by means

of the machinery of the average secret society.

OCCULT FRATERNITIES.

In the fraternities grouped under the head of occult, the purposes in the main are the study of the mystical; they suggest a Swedenborg as founder; their membership is not large and little of their doings is ever made public.

Their significance in this connection comes home quickest to the Freemason who has attained the higher degrees. In their rituals, degrees and lectures he finds them magnifying and emphasizing one or another of the features of some of the Masonic high degrees.

Weishaupt's Illuminati, a secret sect formed in Germany about the time of the close of the war of the revolution in this country, was a schismatic, philosophical Masonic cult, and from it, as it is believed, was taken much that characterized earlier Phi Beta Kappa, the prototype of the long string of college Greek letter fraternities, of which Alpha Delta Phi, Psi Upsilon, Delta Kappa Epsilon, Kappa Alpha, Sigma Phi, Beta Theta Pi, Chi Psi and Zeta Psi are among the earlier and more prominent followers. In nearly all of them the thumbmarks of Freemasonry are plainly discerned.

Reference has been made to the earlier "friendly" societies, the Odd Fellows, Foresters and Druids. Patterned after them, and their masonic decorations, with subsequent additions, are the Red Men, the American Order of Hibernians, the Knights of Pythias, with its legend of distress and rescue based on the story of Damon and Pythias; the so-called Ancient and Illustrious Order of the Knights of Malta, which is not ancient, however illustrious it may be, and which, either known or unknown to all but its founders, is merely the offspring of Templar, Malta and other Freemasonry; the Elks, modeled on the Shrine attachment to Freemasonry, and others which it is not necessary to enumerate.

FRATERNAL INSURANCE.

The American utilitarian, not so say commercial, spirit was not slow to evolve the modified form of a mutual assessment insurance society from the "friendly" organizations which come to us from England, through the Odd Fellows, Foresters and Druids, the earliest having been founded back in the '60's by a Freemason, the Ancient Order of United Workmen, so "Masonic" without being Freemasonry as to amaze if not repel the Freemason who is received into it.

Following in its train there have been formed nearly 200 similar insurance secret orders, one-half of which have withered financially, or are withering, and more than 100 of which are actively alive, some of them very much so. Among the better known and more prosperous are the Royal Arcanum, the Knights of Honor, the Woodmen, the Knights of the Maccabees, the Independent Order of Foresters, various Hebrew secret fraternal assessment orders, several negro fraternities of like character and the short-term assessment societies.

The earlier Sons of Liberty and Sons of Tamina or Tammany of revolutionary days were Freemasons. The "Indians" who threw the tea overboard in Boston harbor were members of a Masonic lodge which had just closed to make the raid.

MEMBERSHIP OF FRATERNAL SOCIETIES.

The membership of the principal fraternal organizations in the United States and Canada is as follows:

Odd Fellows	1,193,749
Freemasons	965,000
Modern Woodmen of America	711,923
Knights of Pythias	562,327
Ancient Order of United Workmen	460,000
Knights of the Maccabees	350,441
Improved Order of Red Men	334,495
Royal Arcanum	277,974
Foresters of America	221,974
Independent Order of Foresters	220,000
Woodmen of the World	217,000
Benevolent and Protective Order of Elks	154,000
Ancient Order of Hibernians	145,000
Ladies of the Maccabees	130,268
Junior Order of United American Mechanics	116,106
Knights of the Modern Maccabees	115,522
Knights of Columbus	98,000
Ladies' Catholic Benevolent Association	87,400
Knights and Ladies of Honor	73,000
Knights of the Golden Eagle	70,000
Tribe of Ben Hur	68,813
National Union	67,223
Order of Eagles	67,000
Court of Honor	66,449
Catholic Mutual Benevolent Association	62,000
Improved Order of Heptasophs	57,255
Protected Home Circle	55,000
Knights of Honor	52,000
United Order of American Mechanics	43,582
Brith Abraham Order	42,781
Ancient Order of Foresters	38,789
Catholic Benevolent Legion	38,286
Brotherhood of American Yeomen	37,684
Order of Gleaners	37,400
Sons of Temperance	34,789
New England Order of Protection	33,361
Independent Order of B'nai B'rith	30,000
Knights of Malta	27,000
Smaller organizations not reported	361,592
Total	7,414,173

GRAND ARMY OF THE REPUBLIC.

SOCIETY OF SONS OF VETERANS. ORIGIN OF THE G. A. R.

The Rev. William J. Rutledge, while chaplain of the Fourteenth Illinois Infantry, was the tent mate of Major B. F. Stephenson, and in the weary hours of their marching and bivouac Chaplain Rutledge had many conferences with Dr. Stephenson concerning the future of the million and more of men who would soon lay down their arms and be scattered all over the Union, the Chaplain insisting that they would naturally desire some form of association by which they could perpetuate their experiences as soldiers of the Union.

Dr. B. F. Stephenson was deeply impressed by this suggestion and appreciated that an organization that would include all honorably discharged soldiers and sailors and the gallant officers who commanded them, whose fundamental prin-

ciples were fraternity, loyalty and charity, would be far reaching in its benefits, the important point being to formulate a ritual that would serve the high and noble purposes they had in mind for such an organization.

Captain John S. Phelps was invited to help them. He became so enthusiastic over the proposition that he worked untiringly with Dr. Stephenson in perfecting the ritual, charter and by-laws for the order.

According to this ritual, lodges were opened at Springfield and Decatur, Illinois.

Following upon the organization of the posts at Decatur and Springfield, a call was made for a grand convention at Springfield for the launching of the Grand Army of the Republic. It was held July 12, 1866, and was largely attended by ex-Union officers and soldiers. This convention gave its unqualified indorsement to the plans formulated by Dr. B. F. Stephenson and his co-workers.

FIRST NATIONAL ENCAMPMENT.

They provided for the first national encampment, which was held at Indianapolis, November 20, 1866. General S. A. Hurlburt was elected commander-in-chief. The senior and junior vice-commanders, surbordinate officers and a council of administration were elected and the order formally launched in its great work.

For some reason the national encampment was not called in 1867, but met in Philadelphia, January 15, 1868, when General John A. Logan was elected commander-in-chief. As was his wont to do, he threw his whole soul into the work and, after a conference with the officers then elected and the council of administration, proceeded to encourage the extending of the order and increasing their good works.

He established national headquarters in Washington and drew around him an able staff. May 5, 1868, he issued General Orders No. 11, establishing Memorial Day.

ITS WORK AND AIMS.

In their stupendous work of succoring the suffering, comforting the living, caring for the dying and the dead, the Grand Army of the Republic has far exceeded that of any other organization the world has ever known. In the cultivation of a spirit of patriotism it has accomplished more than has been by any other methods ever adopted. This influence in the retrospective doubtless inspired the organization of Sons and Daughters of the American Revolution and other kindred societies. It is probably not too much to say that had there been a Grand Army of the Republic at the close of the war of the revolution there never would have been any war of the rebellion. Fraternal ties in the interest of patriotism would have prevented the growth of sectionalism.

SONS OF VETERANS.

Realizing a time would come when the last ex-Union soldier would lie down to peaceful slumber, a wise provision has been made for the perpetuation of the spirit and principles of the Grand Army of the Republic by the formation of the Society of Sons of Veterans, who are pledged:

"To keep green the memories of our

General Kuroki receiving dispatches from Oyama.

fathers, and their services for the maintenance of the union. To aid the members of the Grand Army of the Republic in caring for their helpless and disabled veterans. To extend aid and protection to the widows and orphans. To perpetuate the memory in history of their heroic deeds and the proper observance of Memorial Day.

"To aid and assist worthy and needy members of the order.

"To inculcate patriotism and love of country, not only among our membership, but among all the peoples of our land, and to spread and sustain the doctrines of equal rights, universal liberty and justice to all."

GAMBLING MANIA IN LOTTERIES.

WINNERS ALWAYS LOSE.

There is little agitation against lottery gambling nowadays, and the two or three extensive organizations which continue to sell tickets to the public in devious ways are enormously rich, and but little hindered by the restrictions placed upon their "business" by the government. One of these companies sold nearly $200,000 worth of tickets in Chicago in 1903, although much of this patronage came from nearby towns in which there are no authorized agents.

Nearly all of this illegal business was done with poor people, and it is estimated that there are more than 10,000 laborers, clerks, and mechanics in Chicago who are confirmed lottery gamblers, who invest from 25 cents to $2 every month, and who have been addicted to this habit of gambling for years. About one in every hundred of these, according to estimates made by attaches of the lotteries, "come out even," and about 75 per cent do not win a dollar in a year.

Various commissions are paid to the authorized agents of the lotteries, and some of them pay regular salaries of from $10 to $25 a week to "boosters," who expatiate on the chances of winning, and spread about town the location of places where the tickets can be had. The enormous profits of the companies, all of which are now operated from cities outside of the United States, can be surmised when it is known that they occasionally pay out enormous sums in prizes, and yet never curtail the vast expenses which the exploitation of their contraband tickets requires.

ADVERTISED BY OCCASIONAL WINNERS.

The best advertisement the lotteries can get is that which comes of the boasting of occasional winners, for lottery gambling is like all other forms in that the winners never fail to publish their successes, while the losers are invariably given to the maintenance of a discreet silence. The self-deluding vagaries of the lottery fiend are, perhaps, the most interesting, as they are also the most senseless symptoms of his mania, but some of the stories of "lucky numbers," unfounded expectation, and final disappointment as told about lottery "investment," are interesting, ludicrous, or tragic.

A confirmed lottery player, who is bill clerk in a Chicago wholesale house, was

run down by an automobile in Michigan avenue. Although severely shaken up, he leaped to his feet and ran madly after the car, the driver of which was frightened to find himself pursued. The hatless, panting clerk was satisfied as soon as he caught a glimpse of the number of the automobile and quit the chase. His comrade coming up, asked him whether he meant to attack the chauffeur. "No, I never thought of that," was the answer. "I was never run over before, but luck always goes by opposites, and I'm going to play that number in next month's lottery drawing." He was gratified after a long search, for he found the looked for ticket and bought it for $1. Sure enough, he won a prize, the first he had struck in years of play. That it was only $5 did not diminish his triumph. From his point of view that automobile had "changed his luck."

THIRTY YEARS WITHOUT WINNING.

Luke Brady, an old drayman in St. Louis, played the lottery for thirty years without success. One day last year he received a telegram from the company which said: "Understand you've played our lottery for thirty years and never won. Have decided to give prize to your ticket next month. Wire your number." Poor old Luke was almost wild with delight. He began to negotiate for the sale of his team and dray, and quite made up his mind to go home to Ireland to spend his money and his old age. Luckily he confided to the young business man for whom he did most of his teaming, and that wise young person advised him to wait till he had the lottery money safe in the bank before doing anything that might prove rash.

The story that Luke was to be "handed" the capital prize leaked out and encouraged many a worthless friend to borrow a dollar or two from the lucky teamster. To realize at once on his fortune Brady began to spend money pretty freely and to do as little work as possible. The young business man had frequently urged the folly of lottery gambling on his old Irish employee, and now he warned him that perhaps there was some hoax or some mistake about that telegram. No, there couldn't be. Luke swore, and pulled out the well thumbed, often read dispatch from the company. As the day of the drawing arrived Luke was simply incapable of work. He came down to his friend's store arrayed in a new suit and with many gills of anticipatory celebration stowed beneath his belt. He was hectic, nervous, smiling to himself, the observed and the envy of all who knew what he was waiting for. Toward quitting time a messenger boy arrived with a telegram for Luke Brady. With feverish delight he opened it and read: "Luke Brady, St. Louis, Mo.: Sorry you didn't win. The man at the wheel made a mistake." It was signed by the same company that had sent the first, but now old Luke was in a fury. He showed his dispatch to all who would look at it, and roundly cursed—not the company, mind you, but "the man at the wheel."

"I've a good mind to go down there myself an' bate him within an inch of his life!" roared Luke. "He's robbed me out an' out, that's what he's done!"

Of course it was Brady's friend, the business man, who had sent both the

bogus telegrams, and, if the trick was cruel, it had the desired effect, for Luke never bought another lottery ticket.

HOAX PROVES CRUEL.

Less happy was the experience of the foreman of one of the great printing offices of New York. The lottery habit was growing in the office, and Brown, the foreman, was the most inveterate player. He had won a few small prizes, and he began to notice that the tickets he purchased on Friday often won more than they cost. "That ought to settle it," he mused. "I'll buy one on Friday, the 13th, and see what happens." He did so, and as the proposed big prize of that month was to be $60,000 he bought a full ticket. He made no secret of his hopes, and when the drawing day approached most of the men in the shop knew that Brown was looking for "a killing." It is customary on the night of the drawings to telegraph the numbers which drew the great prizes to all of the big agencies, where they are printed in black faced type on slips of plain white paper.

One of the printers got hold of this slip before Brown had seen it, and, realizing at once that the foreman's ticket had touched none of the largest prizes, thoughtlessly decided to set up and print a fake list with the foreman's number as the winner of the $60,000. Brown, who had seen a score of similar lists, fell into the trap in a minute. His comrades were astonished to see him put on his hat and coat, call his assistant, and announce in a loud voice that he was going to quit instantly. He declared vociferously that he had won $60,000 in the lottery, and that he would leave in the morning to collect it. The practical joker who printed the fake slip of winners was more surprised and scared at the result of his joke than any one. But he was afraid to disillusion his chief, who was a powerful man of the most violent temper. Brown was permitted to go his way, and for days and nights the office was in constant dread lest he should find out that he had been fooled and return in a fury. But he never came back.

SUICIDE FOLLOWS LOSS.

A German cabinetmaker in McKeesport, Pa., being penurious in all but his passion for lottery gambling, was pleased to see that his best workman had fallen in love with his daughter. He liked the young man and was glad of the prospect of handing over his business to the husband of his daughter when he himself should become incapacitated by old age or disease. But the question of a wedding present worried him continually. When the date had been fixed he thought he had arrived at a cunning solution of the question, and he gave his son-in-law-to-be one of the three lottery tickets he had bought for the coming distribution of prizes. This ticket, which had been bought in Pittsburg, won $30,000, and when the old German realized that he had given away the chance to win so great a prize, he killed himself by jumping out of a third story window. He had played the game assiduously for seven years, and the shock of what he regarded as his loss unbalanced his mind.

SOLD $15,000 FOR $2.

A millionaire horseman, whose stable of thoroughbreds was racing at New Orleans, was for years celebrated as own-

ing more "also ran" racehorses than any man on the American turf. He never won with his steeds, and, like the most of his class, attributed his failure to "bad luck." Warned by repeated losses, he seldom backed his own animals for more than a few dollars. His janitor one day asked him to advance $1 on the wages account and the millionaire playfully asked for security. "Ah hain't got nothin' but a lot'ry ticket," said the darky, whereupon the boss proposed to let him have $2 instead of $1 in exchange for the bit of printed paper. That ticket won $15,000, of which Mr. Janitor got a present of $50.

The sporting millionaire said: "My luck has changed," and went south to collect his winnings. He got them all right, bet the whole pile on his own horses, lost every cent of the prize money, sold out his stable, and came back home to look after his rich estate.

TYPICAL TANGLES OF A KING.

CURIOUS PRESUMPTIONS IN ENGLISH LAW.

It is the general impression that, within the very broadest limits, the King of the realm can do just what he likes, which, in theory, at all events, is just what he cannot do. If His Majesty were to do all the things he is supposed to do, and which it is specifically laid down in the rules of the Constitution he must do, his life would be quite unbearable; he would never have a minute of time for his own purposes, he would get no sleep, and he would speedily collapse. Yet, according to this tyrannical Constitution, he would never die, for it is specially set forth that the King does not do so, but that the office merely passes from one person to another. The utmost that it will ever admit is that there may be a "demise of the Crown."

THE KING REQUIRED TO BE SEVERAL PLACES AT ONCE.

It is demanded by the Constitution that the King shall be present at every sitting of Parliament, and it may be news to some people that His Majesty is always supposed to be there. This little difficulty is got over by his presence being understood, though it is not actual. In the same way the King is declared to be present every day when the Law Courts are sitting, in each one of the courts and at the same time.

In this case it is not merely held that the judges represent the King; it is said that he is there himself, and this fiction is necessary for many purposes. If an ordinary person were to bring an action against any other and did not attend at the courts when it was called on he would be promptly non-suited. But there are hundreds of actions brought every year in the name of the King ("Rex") for transgressions more or less serious of the national law, and that the State might never be non-suited in such a matter it is always understood that the King is there in reality.

Again, it is held that on no account must the King go about anywhere, particularly to foreign parts, without having a minister of state in constant attendance upon him to present Parliamentary bills and other matters to him for signature,

Therefore there very often is a minister in attendance, but the King and the Government sometimes wink at this little rule, and His Majesty goes abroad without.

Nominally the Army belongs to the King, but to this day Parliament, having some past experiences of history in mind, is particularly careful that he never owns it for more than a year at a time. There are no "keeps" so far as the Army is concerned. This difficulty is arranged by the passing of an Army Bill once every year in Parliament, which specially grants the Army to the King's use for the ensuing twelve months. If in any year that bill were not passed the King would be without an army.

THE KING'S PARDONS.

There are some other peculiar limitations. As is well known, no matter of what crime a subject may have been most conclusively proved to be guilty, the King can grant him a free pardon without consulting anyone. The royal clemency is often appealed to with this object in view. But until sentence has been actually passed it is beyond the power of any King to set free a man who is undergoing his trial. The Constitution holds that it must prove or disprove the guilt of any man charged, and that then, and only then, the King can do what he likes with him. Again, the King can order any of his subjects to go anywhere he chooses to send him, and he has to go accordingly. If His Majesty singled out any Britisher and told him to go to either Timbuctoo or the north pole, he would have to start at once. But the King has not the power to order a foreigner to walk from one end of the Strand to the other, or even to cross a street. This power is vested in Parliament alone.

With so many delicate restrictions and distinctions the Constitution often runs a risk of tying itself in a knot, so to speak, and has a narrow escape in two or three cases. Thus, though the King can do no wrong, and if he broke the law at any time the fact would be attributed to the "error of his advisers," he is the only man in the whole realm who cannot arrest a suspected felon. All other persons have this power, and it was never intended to deny it to the King, but it has come about, curiously enough, through the operation of the other understanding just mentioned.

NO WRONG WITHOUT A REMEDY.

It is the first principle of English law that there can be no wrong without a remedy. If a man at any time is wrongfully arrested he has his remedy against the person arresting him in an action for false imprisonment. But he could not bring such an action against the King, because His Majesty can do no wrong. Therefore, in this case there might be a wrong without a remedy, which the law will not allow. The Constitution thinks that the best way out of this most awkward difficulty is to instruct all Kings that on no account must they arrest anyone, which is done accordingly.

Another singular fact is that the King of England, in the eyes of the Constitution, never has any youth. He is never recognized as ever having been less than of full age, and if he ascended the throne at three years of age it would be declared that he had already achieved man's estate.

KLEPTOMANIACS.

One of the most striking evidences of insanity among petty thieves is manifested by a preference for some special article often to the exclusion of more valuable plunder which lies as ready to their hands. In some instances this unreasoning weakness for some object of trifling value has driven the kleptomaniac to the most extraordinary displays of ingenuity, patience and cunning.

A well dressed, middle aged woman was arrested in a department store because she was detected in the act of stealing a pair of scissors from the counter. When searched by the matron of the establishment no less than five pairs of scissors were found in her pockets. She admitted that she had stolen them all, but as they were not of the same patterns sold by the store it was evident that she had taken some from other places. She agreed to give them all up to the detective, but could not remember where she had picked them up. A search of her home revealed a collection of 1,100 pairs of scissors tastefully arranged upon the walls of her room. She had sold none of them, and many were cheap, almost worthless, bits of cutlery.

There is in London a thief who has been convicted a dozen times of stealing wheelbarrows. He is no sooner released from jail than he sets forth upon what seems to be an irresistible quest for more wheelbarrows. No matter how rickety, old, or cumbersome the barrow, he will make off with it if he can, but he has never been known to steal anything else. Another display of this peculiarity among thieves is found in the disappearance of thousands of communion cups from churches in which the small individual chalices are used. From one Presbyterian church 216 of these comparatively valueless vessels have been taken in the course of one year, the large jewel studded chalice and paten being always ignored, though quite as accessible as the small ones.

A richly stocked optical store was broken into and ransacked by night prowlers. The place contained costly lenses, microscopes, telescopes, and gold-rimmed eye-glasses worth many thousands of dollars, but the thief took nothing but a hundred assorted glass eyes. The fact that the demand for these contrivances is seldom and slight convinced the police that the burglar was a one-eyed person in search of a mate for his good eye. A month later, however, another shop of the same class was robbed, and, after going over his disarrayed stock, the proprietor was surprised and pleased to admit that nothing of value was missing. The detective, who remembered the former case, asked whether artificial eyes had been in the stock, and, learning that they had, searched diligently with the clerks only to find that the box containing them had been carried off by the thief. The capture of the peculiar burglar followed, but he had two good eyes and had not tried to sell any of his queer plunder.

Criminals or kleptomaniacs of this class are seldom caught and never attempt to explain their erratic preferences. Expert policemen believe that it is an exces-

sive development of the "collection" fad, although it is often found that the thief is wealthy enough to practice a fad of almost any cost without purloining his prizes.

STRANGE INTUITIONS OF SAVAGES.

Travelers among the lower orders of men have often been forced to recognize that they possess some faculty which we, who have improved upon our beginnings, are able neither to exercise nor to understand. "I 'feel' them!" says the Semang, the little Negrit of the jungle-smothered highlands of the Malay peninsula, and thus explains in no illuminative fashion his power of detecting the presence of strangers when they are still far beyond the reach of sight or hearing or smell.

MENTAL TELEGRAPHS.

Quite recently, and not for the first time, attention has been called to the standing miracle which men name the "native telegraph." Most people who have lived much among brown, black, or yellow folk have known instances of the extraordinarily rapid dissemination of news, usually of a calamitous character, in a country where no means of speedy communication were available. Does some native "feel" the shock of the event just as the Semang "feels" the presence of the alien in his deep jungle strongholds? To me it seems that this must be so; that one or more natives, in whose acute perceptions others have learned to repose confidence, experience in an intensified form what we less sensitive Europeans call a presentiment, and putting two and two together, hazard a prophecy which nine times out of ten proves to be curiously near the truth.

This sounds a simple explanation, because a "presentiment" is something which comes within the experience of most white men; but the native prophecy of evil differs from that of the European in that it is more often right than wrong. What it comes to, then, is this: The primitive Semang says frankly that he "feels" that which, according to all known laws, it is quite impossible that he should feel; the Kaffir of the veld or the native of our Eastern bazaars "feels" distant happenings also, and by means of a similar faculty, but his somewhat higher civilization tends to blunt the acuteness of his perceptions, and gives him but a scant grasp of detail; the white man, more insensitive still, "feels" only very vaguely, and often, it should be noted, without sufficient cause. Have we not in this at any rate the hint of a faculty, dulled by disuse or sharpened by constant and prolonged employment, but which must, none the less, be recognized as actually extant, and capable, it may be, of immense development?

SOME ODD THINGS.

STRANGE CITIES OF THE DEAD IN SUBTERRANEAN CAVERNS.

The catacombs of Paris were originally great stone quarries mined when the city was being built. In 1784 it became necessary to remove the Cemetery of Innocents to make way for public buildings and the then abandoned underground quarries

Rifles of the Russian Infantry in the war with Japan.

were used as a resting place for the bones. Other cemeteries within the city were soon after likewise relieved of their dead, whose bones were regularly piled up in the great subterranean vaults, till the vast heaps of human remains occupy two hundred acres under the city of Paris.

PERSON MAY BE SENT BY MAIL IN ENGLAND.

Many persons will be surprised, doubtless, to know that in England a person can be sent from one part of the kingdom to another by mail—just as if he were nothing more than a mere letter.

One day a man called at St. Martin's le Grand with the object of consulting a directory and finding the address of a customer who lived in a remote part of Balham. He was not acquainted with the locality, and was most anxious to see his customer at once. These facts he mentioned to an obliging clerk behind the counter.

He was at once informed that he could be sent to the required address by registered mail at a fee of 6 cents a mile. The man gladly accepted the offer, and in less than a minute found himself in charge of a smart messenger boy, who very soon guided him by the shortest route to his destination.

The boy carried in his hand a printed slip with a description of his "mailed parcel" under the heading "Article required to be delivered," and this he required the man and customer to sign before he left the latter's house.

It is probable that few people are aware of the regulation under which this curious postal transaction was accomplished. It reads thus: "A person may be conducted by express messenger to any address on payment of the mileage fee."

A RAILROAD IN THE ARCTIC ZONE.

Very few Americans are aware that an Arctic railway exists, but it seems that in July of 1903 King Oscar of Sweden formally opened for passenger traffic a railroad well within the Arctic Circle, running from Gellivara, in Swedish Lapland, across the divide to its terminus at Narvik, in Norway, on the Ofoten Fjord. A line southward from Gellivara to Lulea, at the head of the Gulf of Bothnia, had been working since 1887. The traveler who prefers to go by land rather than by water can now reach these regions with no more serious sea passage than the Dover to Calais crossing.

The line owes its existence, we are told, to deposits of iron ore, in the eastern portion of Swedish Lapland, of extraordinary richness. The "Malmberg," or ore mountain of Gellivara, yields annually something like a million tons of iron ore which contains sixty to seventy per cent of pure metal. Richer still are the deposits of Luossovaara at Kiiruna, where the ore is quarried direct from a hill over 3,000 feet high, and is even of better quality than that of Gellivara. The quantity of ironstone in this hill has been estimated at nearly 250,000,000 tons, and now that the line is open to the sea it is proposed to make this mountain disappear at the rate of 1,500,000 tons a year. If this takes place, the world will be presented in 150 years with a demonstration of the kind which it can best appreciate, that capital, if not faith, can remove mountains.

Mr. Davies says the Arctic Circle in Europe is a little bit of a fraud. Except in winter the northern districts of Sweden and Norway are anything but icy. Rugged and infertile they certainly are, but the man in search of snow and ice can find more of it and reach it more easily in Switzerland, in the Tyrol and in Spain. The scenery along the line is in fact disappointing; the engineer naturally selected the line of least resistance in laying, and this of course leads over the enormous "Myr" peat moors which surround the Gulf of Bothnia and through vast tracts of forest land, the character of the country being monotonous, avoiding the picturesque portions and merely becoming more poverty-stricken as it approaches the Polar zone. This is true principally in Sweden; the Norwegian portion of the line, descending to the sea level and winding about the precipitous cliffs of Ofoten Fjord, passes through scenery as magnificent as anything in Norway.

THE EXTINCTION OF THE LAPPS.

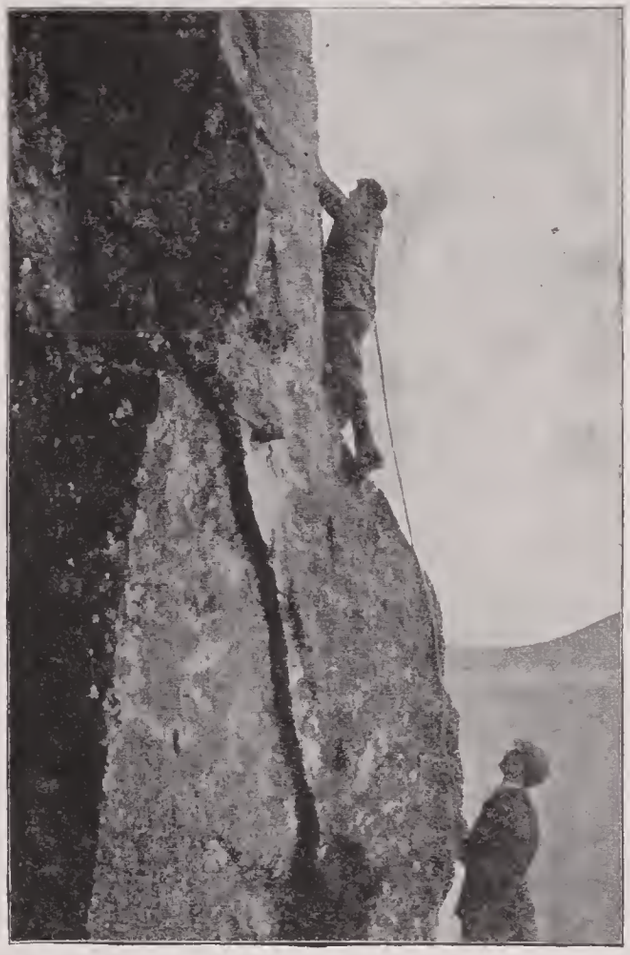
The immediate results of this new railway, we are told, will be the building up of the great iron centres of Gellivara and Kiiruna—a population that will be dependent on supplies brought up from the Gulf of Bothnia or from the Norwegian coast, since the soil is too arid for an agricultural population to supply their needs. Another result will be the extinction of the Lapps, a nomad race at best, half civilized, wholly improvident and absolutely without control if liquor be within reach. Contact with civilization kills out the Lapp, partly by intermarriage, by which he is gradually absorbed in the stronger races, more swiftly and completely by a literal killing out. The reindeer is the Lapp's chief wealth and means of support. He is easily tempted to part with his reindeer for ready money with which to get liquor, and when far gone in drink will sell his best reindeer for a bottle or two of "brandvin." In twelve years the reindeer in a Lapp district known to Mr. Davies have diminished from 37,000 to an approximate 7,000. The increase of wolves, because of the diminishing number of Lapps to wage war upon them, is given as the reason for the decrease of the reindeer. The demand for meat by the miner and railroad navvy will cause high prices for reindeer, and the result will be their steady disappearance. The Lapp, with rare exceptions, can live by no animal save the reindeer. No other animal can subsist on the mosses of Lapland and Upper Sweden. Swedish ethnologists allow only fifty years for the survival of their interesting little neighbor.

CLIMBING THE ALPS.

The first ascent of Mont Blanc in 1904 was a remarkable feat of Alpine climbing, and was made by Herr Hugo Mylius, of Frankfort, on February 25. Herr Mylius was attended by three guides, and much of the ascent, as well as almost the entire descent, was made on skis. The difficulties were immense, a strong, cold wind was blowing, and at times the temperature fell to forty degrees below zero

(Fahrenheit). Herr Mylius had a foot and hand badly frozen, and a foot of one of his guides was also frost-bitten.

The winter in the Alps was most severe, and the snowfall very heavy, with the result that an early and particularly wet spring has caused a perfect rearrangement of Alpine geography. Those



Snapshot showing the peril of mountain climbing in the Alps.

trusty pilots of the mountain, the Alpine guides, no longer know their own particular climbing places, for crevasses now yawn where formerly solid snow lay. Narrow cracks or chimneys that last year formed short cuts to elevated plateaus have disappeared, and in their places are impassable walls of ice.

Snow bridges that joined ridge to ridge have been swept away, and new means of communication have had to be found.

DESTRUCTIVE SNOW SLIDES.

Vast avalanches have in many places changed the whole face of a once familiar mountainside. Avalanches, indeed, have seldom worked such dire disaster in the Alpine districts as during the past spring. The loss of life from this cause alone has been far above all previous records, while the destruction of property has been immense. Whole forests and villages have been swept away, families have been buried alive, while several times entire hamlets have been aroused in the middle of the night by the alarm of an approaching avalanche, and the inhabitants have had to fly in their night attire to places of safety.

About the middle of April there was a week of torrential rain, which caused many serious disasters, the worst of which was the terrible avalanche that swept away part of the village of Grengiols, near the Rhone glacier, costing thirteen lives and injuring seven other persons who, though buried beneath the snow, were eventually rescued. This avalanche of wet snow and mud was estimated to be 3,000 feet long, 250 feet wide, and varying from ten to twelve feet in depth.

Within a few hours of this disaster an even worse catastrophe took place near Turin, where an avalanche descended upon a camp of miners at Pracelato, destroying the cabins and burying over a hundred men, of whom seventy-five were killed on the spot, and several subsequently succumbed to the injuries they received.

REGIMENT SWEPT UNDER.

This was probably one of the most

fatal avalanches that have ever fallen, though on one occasion in 1902 a regiment of Alpine soldiers was carried away and buried under an avalanche while maneuvering on the mountains. On this occasion the snow was fairly dry, and to this fact the rescued men owed their lives. It was two hours and a half after the accident occurred when the work of rescue began, and many of the men were buried beneath from four to eight feet of snow.

The curious freaks of avalanches are shown by the case of seven Alpine tourists who were carried over the Aroser Weisshorn by an avalanche without one of the party being injured; while it is on record that the late Professor Tyndall and a party of friends once literally rode on an avalanche for a distance of 1,000 feet without receiving any hurt.

Dangers of mountain climbing. A final struggle to the top of Sphinx Rock.

Zarmatt is already filling with visitors, though there is a great deal of snow about. On the Riffelberg the snow is still ten feet deep, while on the Gornergrat it

is over thirty feet deep in many places. The upper mountain railway started running on June 15 as far as Gornergrat, the most elevated mountain resort in Europe, and will very shortly run right up to the Riffelalp, the view from which is considered one of the finest in the world.

DARE-DEVIL PERFORMANCES.

THRILLING ACTS FOR LITTLE PAY AT WORLD'S FAIR.

In "Old St. Louis," where a specialty was made of daring mid-air feats, the manager frankly declared that his entertainment cost but a song and that little need be paid nowadays for the average aerial stunt. Professor DeLeon slides 250 feet down an inclined wire by the hair of his head for the insignificant salary of $15 a week, and three times each day James and Alfretta Baum risk their lives high up in the air, performing on a bicycle and suspended trapeze 122 feet above the earth, for something like $13 per risk. A 150-foot wire cable supports a bicycle on which the husband rides backward and forward, while his wife performs on the trapeze that hangs below. High up above the Pike this spectacle has been seen and marveled at by the crowds.

POWER OF THE TEETH.

A similar performance was that of Senor Cameroni, who made a series of sensational slides from the axle-height of the Ferris wheel, 150 feet above the ground, hanging to a leather trolley strap by his teeth, down 2,142 feet of half-inch cable to the earth at "New York to the North Pole." This attracted thousands to that portion of the exposition grounds, as the management had anticipated, but few of those in attendance realized at what a low figure the feature was contracted for. Concessionaires along the Pike state that the wire slide can be put on for $25 a week.

U. S. LIFE-SAVING SERVICE.

Notwithstanding the effectiveness of Uncle Sam's model life-saving service, an element of danger attaches to the daily drowning act of Charles Tucker, who came from Portage Station, Eleventh United States life-saving district, Lake Superior, to take part in the life-saving exhibit at the fair. Each day Tucker, costumed as a farmer, rowed into the lake north of the Agriculture building and pulled a plug from the bottom of his bunty. Then he tries to bail out the water with his hat, but the boat soon sinks and Tucker flounders in thirteen feet of water, apparently helpless. Three times he sinks in a mock effort to keep himself afloat, timing his last sinking to the arrival of the life crew from the shore. A member dives from the life boat and brings Tucker from the bottom of the lake, to all intents lifeless, but to be quickly resuscitated. The regular salary of Uncle Sam's life savers is $65 per month.

Over on the Pike Edgar Cleary went down in a tank of water attired in a deep-sea diver's suit, and there broke his air-line, taking the chances of getting to the surface before his breath gave out. He was under water six or seven hours each day and received $4 for his services.

A picturesque aquatic feature of the fair's great sideshow was the reproduction of General DeWet's escape from the British in the Boer war exhibit. Twice daily a young soldier impersonating the general took a lofty plunge from a cliff on horseback, sinking deep into fifteen feet of water, from which the horse and rider generally rose separately. The rider usually went over the horse's head in the plunge, and after escaping its hoofs and floundering desperately for a few seconds in the water the make-believe general, working on a soldier's pay of $16 a month, emerged and mounts his white horse to ride triumphantly away.

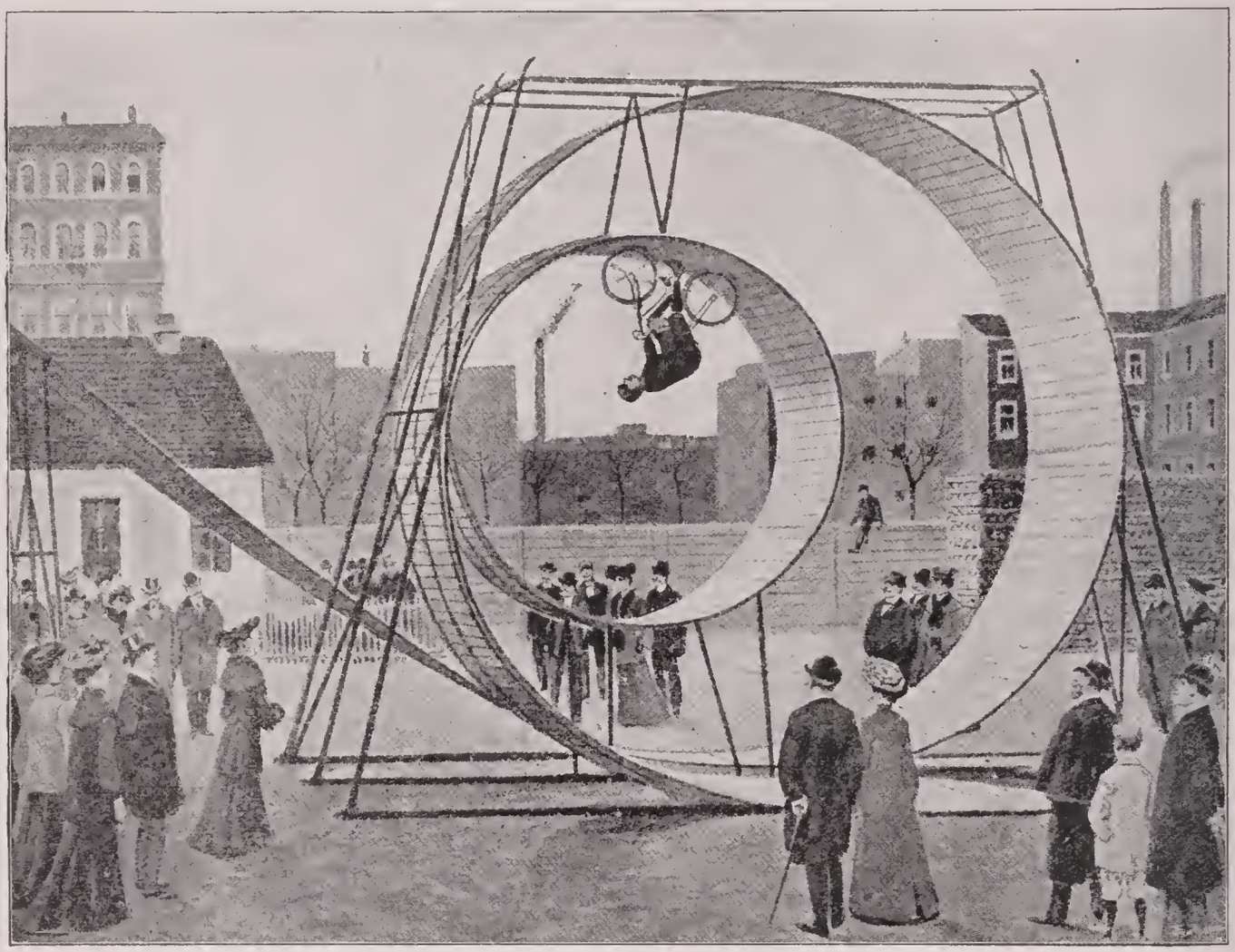
John F. Hassler, steeple-jack, painted the flag-pole which surmounts the Philadelphia North American building, 329 feet in the air, a performance that terrified on-lookers in the streets below. He was photographed by a camera enthusiast, located on a roof sixty-four feet below him.

Mrs. Taylor and her position in which she went over Niagara Falls.

Floyd Jones risked much in the naval battle exhibit each day when, crouched inside a miniature torpedo boat, he steered to the centre of the mimic Santiago harbor and set flame to the fountain of Greek fire there. In an instant the flames spread over the water, and if James was not speedy with his craft he was likely to be enveloped in blazing petroleum and chem-

icals. On one occasion one of the battleships tarried too near the Greek fire and inflammable substances in the interior of the ship were ignited. Then the audience was treated to the sight of an upheaval of the forward turret, a man's head emerged and an instant later a man leapt from the craft into the water. The secret of the miniature fleet's navigation was out.

Most risky and spectacular of all the deeds of Hale's fire fighters was that of Hoseman George Phipps, who slid head-first from the fifth story of a burning building to the ground, carrying two boys, Eddie Hale and Elmer Phipps, in his arms. The rope was wrapped twice around a pompier snap on the fireman's belt, and the rope was so controlled with one foot that his downward slide was stopped when he has reached near enough to the ground to drop the boys rescued from the flames. For this performance the fireman received $100 a month and the boys $10 each per week.



Dare-devil feats. Looping-the-loop twice on a bicycle.

Lizette from Paris leaped the gap in truly sensational style outside the Pike in dreamland. From a platform forty feet high, astride a stout bicycle, she shot down a forty-five-degree incline into a hollow of the track which threw both bicycle and rider into the air. She sailed through the air like a bird going at ter-

rific speed, and alighted on a platform thirty feet away, having leapt a gap of that width in the track along which her bicycle flies.

She had several short falls and once alighted but three inches from the edge of her platform after making the leap. To have missed the platform would have meant almost certain death. Lizette took this risk for $6.

THE HUMAN SLING.

A dare-devil exhibit in which the bicycle rider goes down a steep incline, is caught in a sling rope, turns over a pole and then continues his journey, the path being meanwhile lowered to allow his passage.

The familiar loop-the-loop flourished within a walled inclosure in Happy Hollow, an outside midway. There two bicyclists took the deadly risk each day, darting down a fifty-degree incline eighty feet into a boarded loop twenty-three feet in diameter. Centrifugal forces cause the wheel to follow safely the black line marking the centre of the track, and all goes well. Harry R. Pollay and Jack Smith were the star performers, riding many times a day for $20, and but one other man in the United States is said now to have survived this performance.

Badroo, an East Indian in "Asia," climbed a rope with his toes, and at an altitude of nearly seventy feet performed feats of daring, hanging by his toes and standing out straight from the perpendicular rope, finishing by sliding head-first to the ground.

Herman Bogar supplied a thrill for Hagenbeck's patrons by going into a cage of animals and feeding them raw meat from his hands. Nothing could excite them more. There were in the cage with the trainer two lions, three tigers, a panther, a puma, a leopard, two polar bears, two German boar hounds and a great Dane.

THE WAY UNCLE SAM CELEBRATES THE "GLORIOUS FOURTH."

NEARLY 500 LIVES SACRIFICED ANNUALLY.— VIEWS OF A LONDON WRITER.

It is certainly somewhat surprising that any civilized nation today should celebrate a past victory, however glorious, in a manner which calls for the annual sacrifice of nearly 500 lives, and yet this was the result of "observing" the 4th of July in the United States in 1903. In order to point out the folly of such miscalled patriotism the writer has gone to the trouble of finding out the exact number of accidents attributable to the celebration of this "Glorious Fourth" last year, and the result is somewhat astounding.

These accidents were almost wholly caused through the careless and indiscriminate use of fireworks (principally Chinese crackers) and pistols by children too young to know their danger or too foolish to regard it. The deaths from wounds direct (mostly burns and pistol shots) numbered sixty-three, while those from tetanus arising from wounds numbered 415, a total of 478 lives absolutely thrown away in "celebrating" a victory. Had these deaths occurred in battle the sacrifice would be looked upon as a national calamity, but being in memory of their Independence it is not only regarded as "patriotic," but almost excusable.

THE DEADLY TOY PISTOL.

The cause of the majority of deaths was the toy pistol, which has a playful way of going off in the hand of the one who is using it and inflicting a more or less serious wound. Possibly, in many cases, the result would not be fatal were it not for the fact that apparently there are innumerable tetanus germs always awaiting the opportunity of crawling into such wounds and thus causing numerous and horrible deaths. Indeed, so

many hundreds of children contract tetanus on Independence Day that the disease is now known as "Fourth of July Tetanus" to distinguish it from that arising from other causes.

Instead of endeavoring to lessen these calamities by prohibiting the sale of fireworks and pistols to children, the Government is trying to discover an antidote for that mysterious disease known to the ordinary individual as "lockjaw"; but though one or two cases of cure have been recorded the results have not materially lessened the number of victims who are sacrificed annually on Independence Day.

FIERCE CASUALTIES.

Apart from the number of lives which Uncle Sam's great day claims there are other accidents which occur, and which are only a degree less tragic than the deaths. Each year ten people at least are rendered totally blind, and today there must be several hundreds who are passing their lives in darkness owing to this foolish custom of celebrating an anniversary. Last year no fewer than seventy-one persons each lost an eye, while fifty-four hands and legs were buried without their owners. Of fingers, 174 boys and girls are now mourning the loss of one or more, while the minor injuries treated at the hospitals numbered 3,670. Altogether last year's accidents, fatal and otherwise, reached the extraordinary number of 4,458.

PROPERTY DESTROYED.

In 1902 the accidents were not quite so numerous, which shows that, though last year parents were particularly warned through the press to refrain from encouraging their children in the use of fireworks and firearms, the tragedies of Independence Day are on the increase. The average amount of property destroyed each year is also considerable, amounting, as it does, to half a million dollars, the direct cause of which is due to the letting off of fireworks by children and inexperienced adults. No wonder, then, that the celebration of Independence Day is regarded with apprehension by thousands of parents in the United States whose patriotism is none the less sincere because it is coupled with common sense.

NOTABLE PECULIARITIES.

INFANT BODY AND ADULT MIND.

La Nature is responsible for the statement that a dwarf, Maria Schumann, has just died in Bavaria at the age of 28 years. She passed her whole life in the cradle where she slept her first sleep twenty-eight years ago. To the day of her death she preserved the height and general appearance of an infant of a few months, but "her intellect was normally developed and nothing could have been more curious than to hear this baby in the cradle talk like an adult, with vivacity and intelligence."

A GERMAN CHARACTER BOOK.

To prevent the manufacture of spurious recommendations of servants in Germany every servant is obliged to keep a character book, in which necessary entries of dates and character descriptions are made by the mistress or master. The servant

must then take the book to the nearest police station and have the record dated with the official stamp.

A CENTURY OF WAR.

With slight intervals for refreshment and rest, the war of the Dutch against the Achinese has been going on for more than a century; and though the once powerful kingdom of Achin is now confined to the northwest corner of Sumatra, the natives are still unsubdued. Each expedition sent against the Achinese, though temporarily successful, has been followed by little lasting benefit, except that attrition has gradually worn away the ancient kingdom.

This long war, always conducted with great ferocity on both sides, now seems to have degenerated into a struggle of extermination, in which women and children share the fate of their sons and fathers. The Dutch regard the Achinese as barbarians, but little can be said for the civilization typified by the Dutch commander who calmly announces as a detail of his victory the slaughter of 281 women and eighty-eight children.

Strangely enough, this announcement, instead of being suppressed by the government of the Netherlands, is sent broadcast over the world, accompanied by no adverse comments or a hint of official action against the commanding general of the expedition. And the Dutch capital is the seat of The Hague tribunal, the place from which rules for the amelioration of the conditions of war, its avoidance, and its final extinction, are supposed to emanate.

SATAN'S LEGACY.

There is only one spot on the earth's surface that has actually been willed, deeded and bequeathed to his Satanic majesty. This spot lies four miles and a half south of Helsingfors, Finland. A few years ago Lara Huilariene died in the little town of Pielisjarvi, in the above-named country, leaving considerable property in the shape of landed estate. How he had come into possession of so much land no one seemed to know, but as he was a very bad citizen it was generally admitted that he was in league with Wintahausu (Satan), and that they had many business deals with each other. This somewhat startling opinion was verified when among old Huilariene's papers a certified warranty deed was found which deeded to Satan all his earthly possessions. The will was to the same effect. The family have repeatedly tried to break the will, but so far have been unsuccessful; thus the records plainly show that his sulphuric majesty has a legal right and title to some excellent ground in the near vicinity of Helsingfors. The simple people of the neighborhood have changed the course of the road which formerly skirted the Huilariene homestead and declare that they would not enter the possessions of Satan & Co. for all the money that the three estates would bring.

WICKEDEST OF UNPUNISHABLE CRIMES.

The men who pleaded guilty to having loaded life-preserver cork with iron, demur to the indictment because the stuff was sold in open market, not to the government. Thus they escape because there has been no legal penalty set for such a crime.

The charge against those men exceeds in diabolism any atrocity perpetrated by the vilest felon in any penitentiary in the United States. It would be an insult to other criminals in confinement to compel them to associate with a creature so base, so utterly depraved, so unspeakably wicked as to load life-preservers with iron. When one reflects that the creatures who have pleaded guilty to this indictment are men of substance and fair social standing, it adds, if possible, to the universal feeling of horror and wrath with which they are regarded. There ought not to be a community in this or any other civilized country in which such wretches could find even semi-respectable associates. And the legal profession would not suffer in public estimation if such fiends were compelled to accept defenders on assignment by the court.

But it appears that there is no serious penalty provided by law for the hitherto unheard of crime with which these defendants are charged, so that, if they should be convicted they could not be punished as felons. If this is true, it must be that the absence of adequate provisions is due to the fact that lawmakers have not dreamed of the possibility of such a crime. As there can be no absolute perfection in human government, it happens not unfrequently that provisions absolutely necessary for the preservation of liberty by the protection of individual rights serve as a protection to scoundrels against the hand of justice. Prohibition of retroactive legislation is an indispensable safeguard. But in a case like this, good citizens cannot help regretting the impossibility of reaching the scoundrels by ex post facto law-making. Doubtless Congress will enact a statute to fit any future cases of this description; but for the credit of humanity, it should be hoped and expected that no repetition of this indescribable, this intolerably loathsome thing will ever happen. It is bad enough that the annals of the human race must carry even one such story.

A NOVEL PLEA TO THE U. S. SUPREME COURT.

A Chinaman named Lee Look is under sentence of death in a California jail. He was tried for murder and duly convicted, and there does not appear to be any doubt of his guilt. His victim was a fellow Chinese, not a white man, and this circumstance is responsible for one of the most ingenious and remarkable points ever made a ground for appeal in a criminal case.

Lee Look had his case carried up to the United States Supreme Court, setting up the objection to the conviction and sentence that in the original indictment it was not averred that the victim of the alleged murder was a human being, and that there was nothing to show that he was not a dog. Of course, the name of the murdered Chinaman was given in the indictment, but in the opinion of Lee Look and his attorney it was not a name which necessarily excluded the possibility mentioned.

The Supreme Court dismissed the appeal the other day for want of jurisdiction; that is, the point was not one that could properly be raised under any provision of the federal constitution. The effect of this ruling is to affirm the death sentence, and the merit, technically

speaking, of Lee Look's curious ground for reversal may never be determined. On the part of the prosecution in the case, the omission of the averment that the victim was a human being was an extraordinary one.

MIRACLES IN WOMEN'S FINGERS.

"Women have at least one sense which men do not possess," says Prof. Otis T. Mason, of the Smithsonian Institution. "It might be called the mirror sense, inasmuch as it enables them to see themselves without a looking glass, and even gives them a sort of consciousness of what is behind them. Beyond this they have a kind of vision in their finger tips, as one might say, the sense of touch being to them almost a form of sight.

"Women are constantly working small miracles. Take for example the tying of a knot in a thread with the fingers of one hand. A woman does it off-hand and as a matter of course. That there should be any difficulty about it never occurs to her until some man comments with astonishment upon the feat which she so unconsciously executes. Then she, in her turn, expresses surprise at learning that he cannot do the same thing himself. Why, it is nothing! She cannot remember the time when she could not tie a knot with one hand. The thing to her is mere instinct.

"Instinct means inherited experience, and women have a lot of it. The young lady who threads with such wonderful ease the needle which has no eye that you can find is exercising a faculty which has been handed down to her through a thousand generations. She is not merely her mother's daughter, but the child of a long line of grandmothers running back to the Age of Stone and beyond.

BEAT EGGS FOR AN HOUR.

"This same girl can beat raw eggs in a bowl for an hour without tiring in the least. You offer to relieve her and in five minutes your wrist is so lame that you find it almost impossible to continue the task. Of course, lacking practice, you waste energy, but the chief disadvantage under which you labor is that the muscles of your arm are not adjusted properly for wielding a spoon in that fashion. The young woman's forebears on the distaff side have been cooks for at least 100,000 years, and therefore it is that she is anatomically modified, so to speak, for beating eggs.

"A woman may almost be said to see with her hands. To the dry goods clerk she says, 'Let me see that piece of goods,' but when it is placed before her she feels it with her fingers, hardly looking at it. She puts up her back hair, smoothly and beautifully, without seeing it at all, though when it is finished she contemplates the result in a looking glass. No mere man could accomplish such a feat, which may be said to illustrate the possession by the female of our species of a very peculiar faculty—a faculty that might appropriately be called the mirror sense. To a certain extent, apparently, a woman can see herself without looking in the glass.

NOT SO WITH MEN.

"To a man the whole art of pinning things is a mystery. Apparently there

can be nothing to it beyond the insertion of the pin and the passing of it in and out of the pieces of fabric which are to be temporarily and mutually attached. Any fool can do that, and it is noticeable that the male person does the job in a careful and even scientific fashion, which ought to represent the highest degree of effectiveness. But somehow it doesn't. The pin comes out, and 'cuss words' are liable to follow. 'Oh, John, let me!' says the man's wife. She takes the same pin, and, without making any apparent use of the divine gift of reason, inserts it. She does not even begin at the natural place of beginning, but executes a sort of overhand movement, takes a species of double-hitch, and with a wriggly thrust the thing is done. It holds as if it were sewed.

"The hairpin, of course, is only a modified pin, made double. As every one knows, it is a woman's favorite utensil—a whole tool box, in fact. It is to her a master-key to all mechanical problems. She buttons her shoes with it, trims lamps, opens letters—but the list of its capabilities is too long for ready recital. It is the universal feminine implement, and is made to serve even for cleaning the tobacco pipe of the inadequately appreciative husband or brother.

MAKES BOTCH JOB.

"It is an admirable tool, but where is the man who is able to use it? In his hands it is as valueless as a sewing macine in the possession of a naked savage. To him even the art of pinning hair with it is a puzzle. Let him try, if his lady love is willing to submit to the foolish experiment, and see what a failure he makes of it. Though he may do his best, with an unlimited number of hairpins, scarce two locks will hold together.

"How is it that a woman is able to tie a ribbon bow and that a man cannot? He can make a bow out of ribbon, of course, but it is an altogether different article—a product essentially masculine. She gives the ribbon a couple of twists with her fingers, adds two dexterous jerks and a pat to right and left, and lo! the miracle—it is nothing less from your point of view or mine—is accomplished. You could not reproduce it to save your life.

"I might add—for it is another curious freak of adaptation, illustrating the differentiation of the sexes' capabilities—that the kind of a bow a man ties is almost equally a mystery to a woman. She cannot for the life of her imitate it satisfactorily, and, occasionally, for the ornamentation of her own dress, she will persuade one of her male friends to make such a ribbon knot for her. Though it is really an inferior article, she likes it because it is different from the sort of bow she knows how to make.

"Speaking of making knots reminds me of an Eskimo woman I once met, who, for my edification, tied in her mouth a short piece of string into a bow-knot, using for the purpose neither of her hands, but merely her tongue. The tongue, of course, is an organ of touch much more sensitive than the finger tips, and with its aid the squaw was able to wriggle the end of the cord in and out until at length she took the string from her lips tied into perfect bow-knot shape.

CLEVER WITH NEEDLE.

"But, to return to civilized existence,

did you ever marvel at the cleverness of a woman who, sewing a bone button on a piece of cloth, hits one of the holes every time with her needle from the back side of the fabric? If you were performing the task you would strike the button and not an opening three times out of four, and, when by chance you did get through an aperture it would be nearly always the same one. But the lady, without giving any conscious attention worth mentioning to the problem in hand, almost never hits the button, and her thread goes through the holes impartially.

"When we try to discover a reason for the manifest superiority of the gentler sex in matter such as these, we should realize that women were originally the industrial sex. They were the first tailors, the first cobblers, the first tanners, the first butchers, the first basket makers, the first weavers, the first millers and the first farmers. To mere man there was nothing left save the pursuits of war and the chase, which were about all he would condescend to attend to. Thus, all through the history of mankind, women have been the conservers of the arts, and what they have learned in the course of ages of experience they have been unable to forget.

"But these are minor feats. There are many other things, wonderful from the masculine viewpoint, which women do every day as a matter of course. To call them miracles is not so very inappropriate, considering the utter inability of the sterner sex to reproduce them. Philosophically speaking, they should properly be considered as marvels wrought by beings who, in certain important respects, at all events, are very decidedly our superiors, and well equipped, if we would only believe it, to serve as our guides and teachers."

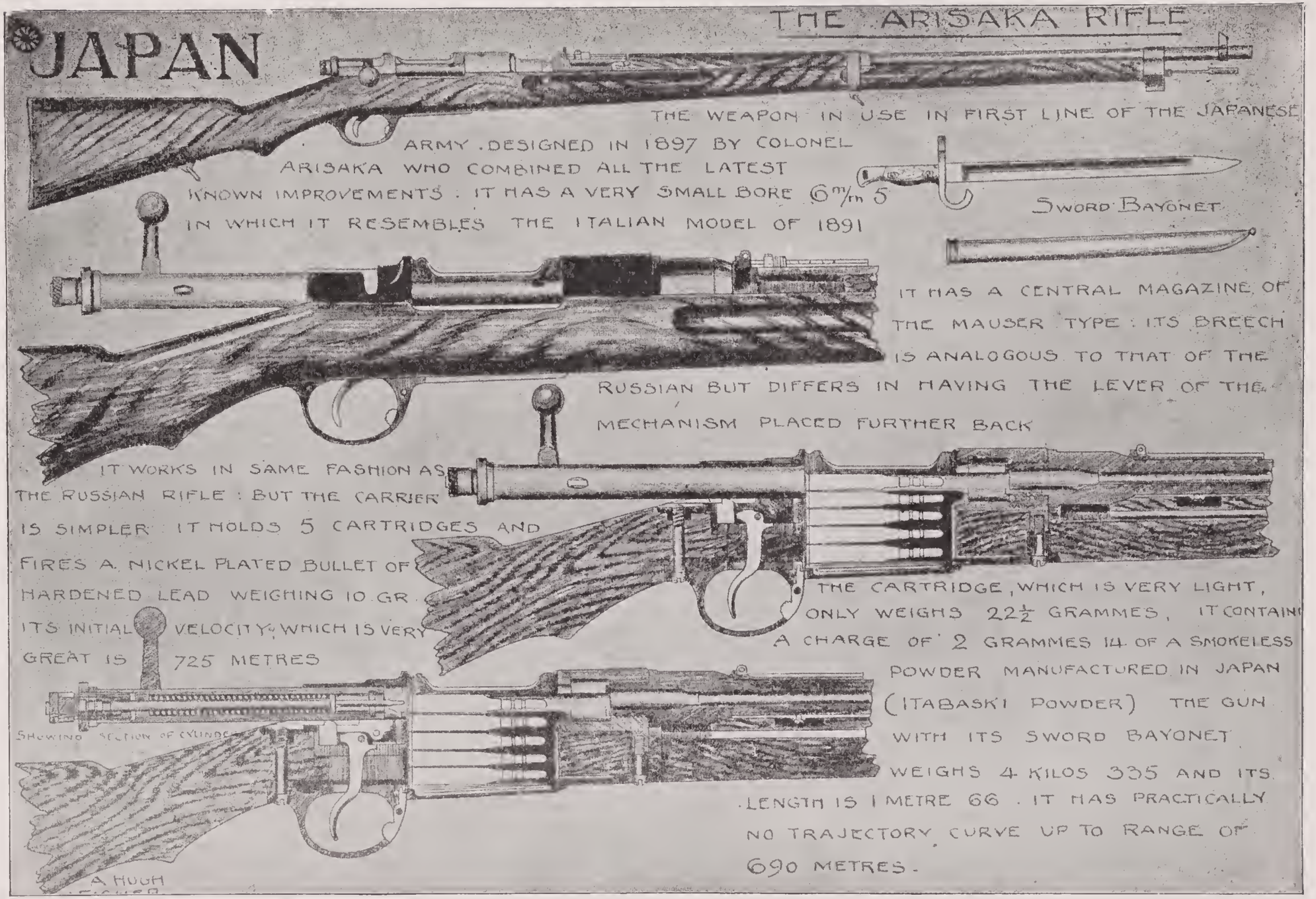
FACTS OF SPECIAL INTEREST.

WHEN THE BLIND SEE.

Professor Latta of Glasgow tells of a man who, having suffered from cataract from his birth, recovered his sight at the age of thirty. The patient before the operation was unable to distinguish objects, though he could tell daytime from night, and could locate a light. "For about ten days after the operation the patient appeared dazed and could not realize that he was seeing," says Professor Latta. "The size of everything in the ward seemed very much exaggerated, and on that account he had very great difficulty in interpreting what he saw.

"The first thing he actually perceived was the face of the house surgeon. At first he did not know what it was, but when the doctor asked him to look down, the sense of hearing guided his eye straight to the point whence the sound came, and thence, recalling what he knew from having felt his own face, he realized that this must be a mouth and that he must be looking at a face." He was entirely ignorant of color, but learned to distinguish hues very quickly.

As he looked out of a high window he felt as if he could touch the ground with a stick. He did not retain his faculty of moving easily about in the dark. Before, he could guide himself fearlessly through a ward, but now, says the physician, he has lost all that feeling of confidence, and



Rifles carried by the Japanese Infantry in the war with Russia.

when his eyes are shut he is afraid to move, and is impelled to open them to ascertain where he is going.

EXTENT OF SPOKEN LANGUAGES.

There are 382,000,000 Chinese speaking the same language, making Chinese the most spoken language. There are many dialects, however, which seem scarcely to belong to the same tongue. The inhabitants of Mongolia and Tibet can barely understand the dialect of the people in Pekin. Other widely spoken languages are as follows, in millions: English, 120; German, 70; Russian, 68; Spanish, 44; Portuguese, 32.

IN BARBAROUS TIBET.

According to Jameson Reid, who recently traveled through the country. it would be impossible to imagine a people more unenlightened and barbarous than the native population of northeastern Tibet. He says that they are but a grade removed from the animals. At one of the villages his party was honored at a sumptuous banquet and the gluttonous appetites displayed by the natives seemed to know no limit. Each diner consumed vast quantities of food and washed the same down with great draughts of tea and other native drinks. Mr. Reid was puzzled to know where they stored all the material they had eaten and contents himself with the remark that the problem of a Tibetan's stomach would trouble a professional mathematician, adding that the chief avocation of the Tibetan, when fortune permits, is the enjoyable business of eating.

"During many months," says Mr. Reid, "spent among Tibetans—to say nothing of their manners, excluding women from all companionship at their meals, dipping their hands up to the elbow in one dish, eating sheep's insides and sleeping in miserable tents or stone dwellings crawling with vermin—I never in a single instance noticed temperance or frugality, except from necessity, for in their nature they are gluttons and will eat at any and all times till they are gorged of whatever they can get and then lie down and sleep like brutes. I have sometimes amused myself by testing their appetites. Instead of scorning tainted or unfit food, they will devour it with avidity, even with the full knowledge that they must pay dearly for this incontinence.

"One of the strangest customs of these Djun-Ba Tibetans is that attending death and burial. When a man dies the nude body is attached to a stake driven into the ground and exposed to the attacks of ravenous beasts and birds. Nothing could be more ghastly than to happen upon one of these grewsome landmarks, from which flocks of carrion vultures rise slowly into the air with hoarse croakings. The bones and other remains left after the attacks of the birds and beasts are cremated, the ashes placed in sacred bowls, mixed with magic charms and hung up in the tent or dwelling or else buried beneath an obo of stones. A little of the dust is placed in small bags and these are worn round the necks of the family as preventive of disease."

INTERESTING FACTS CONCERNING THE HUMAN BODY.

1. Every day there passes into and out of the lungs about 400 cubic feet of air.

2. Each outgoing breath renders impure 5,000 cubic inches, that is, about half a barrel, of air.

3. It is said that a normal skin absorbs one-sixth as much oxygen as the lungs.

4. The body pours out through the skin about two pints of perspiration each day.

5. During each year about one and a half tons of material pass through the human body.

6. The skin covers an area of twenty square feet perforated by about 7,000,000 perspiratory ducts or pores.

7. There is in the body of a man enough iron to make a dozen tacks, enough phosphorus to make a half dozen boxes of matches, and enough hydrogen to fill a balloon that would lift him.

8. There are in the human head about 120,000 hairs.

9. The heart beats at an average of seventy-five times a minute.

10. The blood stream moves at the rate of seven miles an hour, 168 miles a day, 61,320 miles a year. In the body of a centenarian the blood has traveled a distance of 6,132,000 miles.

THE MOST ACCURATE TIME-PIECE IN THE WORLD.

A watch or clock, no matter how carefully constructed, may gain or lose a fraction of a second, but there are 600 stars in the heavens that are infallible. For this reason the United States government furnishes facilities for the regulation of time-pieces by the stars. The time-correcting apparatus is in the Goodsell Observatory at Northfield, Minn.

A few minutes before 9 p. m. the official observer takes his place before a big telescope, which has a series of parallel wires across the opening nearest the eye. The centre wire is so fixed that it is in unison with the meridian. When the particular star chosen for the determination of the time begins to cross the telescope field, and reaches the first wire, the observer communicates with the telegraph operator in another room, and the signal to get ready to mark the time is sent out over nearly 12,000 miles of wire, into every part of America. When the star crosses the centre wire, which denotes the meridian, the observer notes it to a hundredth part of a second, and this observation is flashed over the telegraph lines instantaneously.

To secure an exact "check" between the crossing of the star and the official record the observer holds in his hand a movable telegraph key attached to a wire running out into the operator's room, where it is connected with a chronograph, or time writer. This machine consists of a cylinder of white paper, over which a pen moves automatically in unison with a clock. Every time the clock ticks it jars the pen, making a slightly jagged line on the roll of paper.

When the star crosses the line the observer presses the telegraph key, thus making a record on the chronograph, which is compared with the record the clock has been making during the day. The two records are examined with a microscope, and if the clock is off a hundredth part of a second it is corrected. It is undoubtedly the most correct time-piece in the world.

The same operation is gone through with at 10 a. m. There are also distribu-

ting centres for time connected daily with the Goodsell observatory. The naval observatory at Washington receives the signals over a special wire, and acts as the centre of the time service.

Washington university in St. Louis sends the time corrections to the railway systems of the Southwest. Allowing for slight and unavoidable variations caused by changes in temperature within a given hour the clocks of the country regulated by this system are kept as correct as human ingenuity is able to make them.

WORLD'S QUEER CUSTOMS.

In Lapland, the crime which is punished most severely, next to murder, is the marrying of a girl against the express wish of her parents.

In Armenia, children are not allowed to play with dolls. It is feared that if this were permitted the little ones would learn to worship them as idols.

Many old houses in Holland have a special door, which is never opened save on two occasions—when there is a marriage or a death in the family.

A Cuban baby is baptized when it is two weeks and a day old at the very latest. A Cuban baptismal party would not think of walking to church, even though the building be next door.

One of the curious social laws of Peru forbids women to attend funerals, and they do not appear at weddings (except as one of the principals), unless they are very intimate friends of the contracting parties.

Japan has 200,000 registered cases of leprosy. There is no pity or compassion for the lepers. Man or woman, young or old, they are turned adrift on the highways, homeless wanderers, dependent for subsistence upon casual doles of food thrown to them from afar.

The making of shoes for dogs has now developed into quite a big industry, and is especially flourishing in Labrador. The dogs attached to sledges travel at great speed over the rough ice, and some protection for the feet is necessary. The shoes are made of sealskin.

Palestine is a land of flowers. Botanists tell us that there are 2,500 different kinds. The Eastern sun gives the colors a brightness they seldom have in our hazy clime. The wild flowers are somehow localized, so that acres, and, indeed, miles, take their hue from a single flower.

Keeping a tobacco shop in France is a position greatly coveted by gentlewomen in reduced circumstances. The sale of tobacco being a state monopoly, the government generally bestows the right to keep a bureau de tabac on the widows and daughters of officers and government officials.

SACREDNESS OF MOSLEM. GRAVES.

In Turkey a Moslem grave, when once it has been filled in, is never to be reopened on any account. With a view to remove the faintest chance of a grave being thus defiled, the Moslems plant a cypress tree on every grave immediately after the burial, thus making their cemeteries resemble forests.

They have curious methods in Persia of insuring law and order. A failure of the crops had resulted in a dear loaf, which much enraged the populace. In order to quell the tumult, the Shah ordered a number of bakers to receive sev-

eral hundred strokes with a rod, besides a few minor little attentions, such as the amputation of an ear or two.

"Miss" is a title with which we brand unmarried women to indicate that they are in the market. Miss, Missis (Mrs.) and Mister (Mr.) are the three most distinctly disagreeable words in the language, in sound and sense. Two are corruptions of Mistress, the other of Master. In the general abolition of social-rank titles in this country they miraculously escaped to plague us. If we must have them, let us be consistent and give one to the unmarried man.

WHAT THE STONE BALLS MEAN.

In ancient times it was the custom of the victors in a battle to decorate their doorposts with the skulls of the vanquished. With the advance of civilization, Britons, of course, no longer carry it out, but the custom has not been allowed to drop altogether, as is seen by the stone balls which are often set on gateposts—a relic of a barbarous idea of long ago. In certain parts of Africa the skulls are still used as decorations; whole villages may be seen with the doorposts of the houses surmounted in this gruesome fashion.

VACCINATING THE GROUND.

That the soil can be vaccinated to cure its barrenness, with the same result that attends the vaccination of the human body to cure certain ills, would appear preposterous to the casual mind, but this is exactly what is done, according to an intensely interesting article entitled "Inoculating the Ground," by Gilbert H. Grosvenor, in the October number of the Century Magazine. In the most simple language he describes how, by a process of inoculation, the nitrogen, so necessary to fruitful land, is put back into the soil which is robbed of it by wheat and many of the other grain crops, and rendered unproductive by reason of the robbery.

Even a skeptic reading Mr. Grosvenor's article must be impressed by it, and at the end of the story see visions of vast tracks of now barren fruit lands in the eastern part of this country reclaimed and fruitful. Probably the most pleasing thing about the whole matter is that the nitrogen germs so necessary to the soil's productiveness are furnished free by the Agricultural Department, the letters patent having been presented to the government by Professor Dr. George T. Moore, in charge of the laboratory of plant physiology of the department, who discovered how to practically utilize nitrogen germs.

But Dr. Moore was the real discoverer of the germs. It has been known for many years that the air we breathe contained all of the nitrogen so necessary to the soil, and it was known that certain plants, like the clovers, bean and pea, did not impoverish the soil as some of the grains did. It remained for Professor Nobbe, a German scientist, to discover, as Mr. Grosvenor declares, that the bean especially takes its nitrogen from the air and that it absorbs more than it needs, and actually enriches the soil with the surplus supply.

BACTERIA IN PLANTS.

Then he found that all of these plants had bulbs, or round tubercles, or nodules, attached to the roots, as if an insect had bitten them. He dissected one of these bulbs and found it filled with bacteria that

worked incessantly, absorbing nitrogen from the air to feed the plant.

Then the professor successfully cultivated these bacteria, and a German company was actually formed to supply them to farmers in bottled form. They did not live because they had been too well fed by the professor, says Mr. Grosvener, and hence were not used to working for themselves. In the soil they died. The company stopped manufacturing.

Professor Moore cultivated a self-reliant disposition in his nitrogen bacteria. He did not overfeed them, and they began to seek their nitrogen food themselves. Having obtained permanent bacteria, he found a bit of cotton would soak up millions of them. Then he dried it, and in this form it is sent to the farmer, who is directed to soak the cotton in a solution of water, granulated sugar, potassium phosphate, magnesium sulphate and ammonia phosphate. The solution is then mixed with earth, so that every particle of the earth is moistened. It is then mixed with five times the quantity of earth and scattered over a barren field, vaccinating it with nitrogen germs that multiply and cause bountiful crops. One small package, it is said, will inoculate one to four acres.

TRACKLESS DESERTS OF THE OCEAN.

Oceans, like continents, have their deserts. On the high seas there are vast spaces whose waves have never been parted by the prow of a sailing vessel or lashed by the propeller of a steamer—immense solitudes where the flap of a sail is never heard nor the strident cry of a siren; veritable deserts, whose silence is broken only by the howling of the wind and the roar of waves which have been vainly pursuing one another since the day of creation.

These deserts lie forgotten betwixt the narrow ocean highways traveled by vessels. In such waste places of the sea a disabled ship, driven out of its course by a hurricane, may drift for months, tossed by the ceaseless ground swell, without being able to hail assistance; her only chance of escape is the possibility that some oceanic current may drag her into a more frequented region.

It is generally supposed that by reason of the universal increase of maritime traffic the sea is everywhere furrowed by vessels. That is a mistake.

The gradual but constant disappearance of sailing ships made the ocean more of a desert than before. Sailing vessels had their established routes in accordance with winds, currents and seasons.

This is no longer true today. The liner goes straight ahead in defiance of wind and wave. The ocean highways are, therefore, anything but numerous. The most frequented of oceans is the Atlantic.

Apart from Polar seas there is but one desert zone in the Atlantic—a dreary waste of waters between the routes from Europe to the United States or Canada and those from Europe to the Antilles. In the south, between the routes from South America or the western American coast and the routes from South Africa, extends a desert occasionally traversed by the steamers of the lines from Cape Town and Mozambique, which, when the coffee season is at its height in Brazil, cross the Atlantic for cargoes at Rio Janeiro or Santos.

The Indian ocean is frequented only in the north by lines out of India and Indo-China, and a little in the west by liners from Oceanica, which call at Colombo and then make straight for Australia.

Two lines, each with a steamer a month, follow a slender lane from Australia to Cape Town. The Pacific is the Sahara of the great seas. Saving only the steamships from the far East to California and British Columbia, a line from Sydney to San Francisco and a one-horse line (with sailings four or five times a year) between Tahiti and the United States—save for these mere ribbon-like streaks the Pacific is a desert.

BIBLES IN MANY TONGUES.

Three hundred million copies of the Bible have been printed in a century.

The British and American Bible Societies alone circulate some 8,000,000 copies a year. Forty per cent of the cost is recovered from sales.

Often the payments are made in curious substitutes for money, such as cowry shells in Uganda, copra and arrow-root in the New Hebrides, swords, daggers, sandals, amulets, straw hats, pieces of silk, eggs, butter, rotten cheese, dogs' teeth, sea-birds' eggs and other picturesque circulating material. Occasionally, even, Bibles are stolen.

Something like 2,000 colporteurs and Bible-women travel in all manner of outlandish places, "by railroad, carriage, boat, bullock wagon, sleigh, bicycle, wheelbarrow, on mule, jinrikisha or afoot," to distribute Bibles.

Bibles must be packed in water-tight parcels to be landed through the surf in Madras; they are made up in fifty-six-pound packages to fit coolies' backs in Annam.

A century ago the Bible was printed in forty languages. It is now printed in 450, and new ones are being added every year. Sometimes languages are practically made by the Bible—that is to say, it is the first book printed in some obscure tongue, so rude that it does not even contain words enough to express thought.

Take, for example, the translation just made for the Sheetswa tribe in East Africa. They had no word for Supreme Being, or home, father, heaven, house and other ideas equally fundamental. Other recent translations have been into Mare, Persian, Uganda, Labrador-Eskimo, Kongo-Baldo, Wedan, Fang, Madarese and Nogugu.

And there are said to be on the borders of the Indian Empire alone 108 languages in which there is no Christian Scripture printed.

BOOK IX

STRANGEST OF STRANGE EVENTS AND FACTS

WITH VARIOUS

Astounding Happenings from All Parts of the World, Illustrating the Oddities and Peculiarities of Human Society

A MIRROR OF ASTOUNDING EVENTS FROM ALL QUARTERS OF THE GLOBE, IN THEIR SIGNIFICANCE AND RELATION TO HUMAN AFFAIRS

Russian convicts offered freedom for carrying messages from Port Arthur to the Russian camps were rarely successful owing to the vigilance of the Japanese patrol.

Strangest of Strange Events and Facts.

SINKING EARTH AND BOTTOMLESS PITS.

THE unusual catastrophe of a road bed giving way under a carriage, sinking out of sight and swallowing up the carriage with a woman occupying it, happened a short time ago near the village of Newberry in southern Florida.

The woman, who was a traveling drug seller, having finished her work at Newberry, concluded to visit the near-by phosphate mines in the interests of her business, and to convey her to the mines procured a two-horse livery carriage with a negro driver.

The drive, which is a pleasant one, had continued without incident for several miles when, in passing through a sink locality, the roadbed suddenly became shaky and then sank into water, the woman, carriage, horses and driver sinking with it. The driver, however, heeding the first warnings of the danger to which they had been so unexpectedly exposed, sprang from his seat and cut the traces of the horses struggling up the sinking bank, and both he and the horses were saved. About an hour after the submergence the carriage was pulled out of the hole with its lifeless occupant upon the seat.

FIRST LIFE LOST.

This is the first human life that has been lost in this way in Florida. Cows and other domestic animals, however, are frequently swallowed up by the earth sinking under them in the Newberry region.

But close approaches to fatal results from earth bottoms dropping out are of occasional occurrence in this state. Doubtless the most remarkable one of these on record was the falling in of a section of railroad bed near Gainesville in August, 1804. The sinking occurred while a freight train was passing over the place. The hole formed was forty feet deep. The locomotive had crossed the place before the ground gave way, but four of the cars went tumbling into the pit. That none of the train men were hurt or killed seemed almost miraculous.

The sinking of the earth, as occurring at Newberry and Gainesville, forms what are known as sink holes, and they are caused by the falling in of caves in limestone rock. The bedrock of the Florida peninsula is Eocene limestone. This rock was formed at a late period of geological time, and is softer and much more porous than that of the older limestone formations. It is quite pervious to water, is cracked and fissured, and in many places honeycombed with cavities, caverns, water courses and other evidences of eroding action. The rock-wearing constantly going on within a limestone cave may so greatly weaken the roof that it can no longer support the weight of rock and earth upon it, and it will fall in, forming a sink.

Some sinks contain water and some are dry. Those containing water usually have subterranean outlets, which carry away water that may run into the holes from springs in their banks, floods from rains and sometimes streams of considerable size flowing from lakes.

THE "BOTTOMLESS PIT."

The "Bottomless Pit," a sink in Orange county nearly 350 feet deep, whose water level is thirty feet below the water level of a large near-by lake, doubtless has an outlet in the Atlantic ocean or Gulf of Mexico to carry away the water flowing into it from numerous springs in its mouth. Into another sink in the same county, near Orlando, a large stream of water disappears, the overflow from more than a dozen lakes. The outlet to this sink became plugged about two months ago, and all efforts to remove the obstruction thus far have failed. The water has, therefore, taken overland routes and has spread over several hundred acres of the surrounding country, covering fruitful fields and backing under houses. The "colored" suburb of Jonestown, near the sink, seems likely to become engulfed, and the sable inhabitants, frightened and mystified at the coming of another flood upon the earth, contrary to God's rainbow promise, are leaving the place for higher and drier habitations.

In the Newberry region sinks serve incidentally a valuable purpose. Phosphate mining is carried on very extensively here, and a great deal of water is pumped into the phosphate washers where the rock is cleaned for market. The neighboring sinks carry away the dirty water from the washers. It first flows into flats and hollows, and these overflow into the sinks.

Sometimes in sink forming the drop is only a few feet, and the mouth is widened at the top, forming a conical hole. In some cases there is a clear drop of from thirty to fifty feet, leaving a hole like a deep well. The water of such sinks usually becomes clear shortly after falling-in occurs, indicating that the falling ground fell into flowing water. The original settlers of the Newberry region built their houses near these natural wells to save the expense of digging for water.

POPOCATEPETL SOLD FOR $500,000.

Years ago—a generation back—a youth graduating from the Military Academy in the City of Mexico was convinced by the teachings of the great Alexander von Humboldt that the crater of the giant, snow-capped volcano, Popocatepetl, contained large deposits of sulphur.

The possibilities of such a deposit appealed to him with striking force. The volcano is not active enough to be dangerous, so to mine it would not be difficult. Sulphur is one of the most valuable products of the earth; it could be sold at an enormous profit.

The youth—by name Gaspar Sanchez Ochoa—was bold enough to ask the government for a concession.

War came and interrupted the negotiations. Ochoa joined the Republicans under General Diaz and served them gallantly. When the conflict was ended, Ochoa, then a general, was asked what reward he would like to have.

"Give me Popocatepetl," he replied.

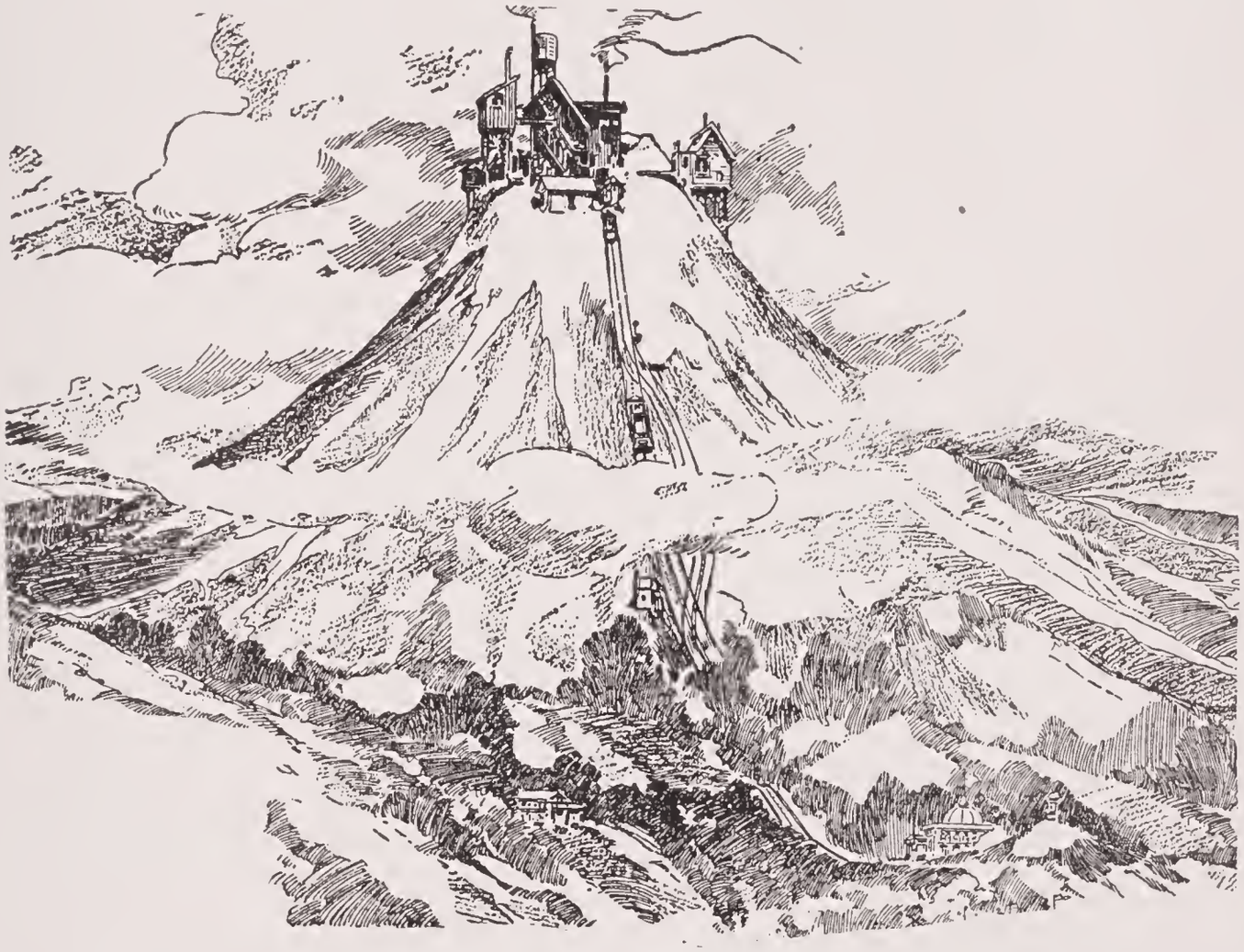
No sooner had he asked for it than the volcano was deeded to him.

The gift made young Ochoa celebrated as "the man who had a volcano on his hands." Now that he had it, what could he do with it? the people asked.

Undismayed, he prospected his mountain, 17,520 feet high, and, as he believed he would, found millions of tons of sulphur. Then he hired natives to dig the sulphur out and carry it down to the base in baskets—and, within a dozen years or so, he found himself a millionaire. Year by year his friends, who had smiled at his strange possession, saw him pile up more and more dollars.

Ochoa is an old man now. Having made up his mind to retire from business, he sold his volcano to a syndicate of American capitalists for $500,000.

They are going to turn Popocatepetl into the loftiest and most picturesque health and pleasure resort in all the world, and, at the same time, convert its crater into the most valuable sulphur mine.



Popocatapetl, the great Mexican volcano, sold to an American syndicate for half a million dollars. Its crater is an inexhaustible sulphur mine.

The crater is estimated to contain 148,000,000 tons of sulphur which increases at the rate of 1 per cent a year.

FOUND IN ODD PLACES.

One of the officers on Colonel Younghusband's staff writes to a friend that

they are frequently finding objects which are strangely out of place. A few months ago, when they were at Khamba jong, this officer picked up a pair of gloves bearing the name of a well-known London maker; while in the Tang Pass a private picked up a small, well-thumbed English dictionary, with a carte-de-visite of a young Englishman pasted on the flyleaf.

Quite a curious chapter might be written on those two finds were it possible to discover the owners of the lost property. They indorse, at any rate, other out of the way finds.

Sir Henry M. Stanley, the great explorer, had in his library at Richmond Terrace, Whitehall, many curious finds which he came across in his wanderings across the dark continent of Africa. One is a silver-plated fork bearing the name of a fashionable London restaurant. This fork was found in a part of Africa which had never before been trodden by the foot of a white man till Stanley had broken the record and arrived there with his little band. A pigmy, whose tribe was unknown till then, was wearing the fork around his neck as an ornament.

Emin Pasha in his memoirs relates that one of the greatest glories of an Abyssinian chief he knew was a George III wig, which adorned the chief's head on very special occasions. How he came by it was a mystery even to Emin Pasha himself. The headpiece bore the name of a London maker.

A sergeant in the Manchesters, who was present at the fall of the native fort at Chitral when the English captured it, picked up a money-lender's circular of comparatively recent date. How it found its way to that distant region of India will ever remain a mystery.

The royal mother—the ex-Empress Eugenie, who is still living—after the first pang of her great sorrow was over, inquired of her late son's brother officers if the Zulus had taken a keepsake which the prince was wearing around his neck at the time of his death. This keepsake was a religious emblem known as Agnus Dei. It had been taken.

Soon afterward a great British victory was won and some hundreds of the dusky warriors were taken prisoners. Quite by accident a British officer discovered, suspended around the neck of a Zulu, the missing emblem. It was taken from the man and sent at once to the childless empress, in whose possession it now rests, and forms her greatest treasure

BULLET HOLE IN BRAIN; MAN MENTALLY SOUND.

With a bullet hole through both lobes of his brain, Frederick Bock, who shot himself July 11, 1904, is in the city hospital in Newark mentally sound. He will leave the hospital in a few days and the physicians say he will never feel any ill effects from the wound.

Bock's case has only one precedent—that of a man whose brain was pierced with a crowbar and was treated successfully.

According to the surgeons attending Bock there never has been a case where a man's brain has been pierced that the sight or mind was not affected.

POLICEMEN WHO MARRY THEIR PRISONERS.

Some years ago a well-known author wrote an interesting "shilling shocker"

in which the beautiful heroine is accused of murder. The official who arrests her falls desperately in love with his pretty prisoner, and after the young lady has been found guilty, sentenced to death, reprieved at the last moment, and finally, through the timely remorse and confession of the real culprit, is set free "without a stain on her character," the courteous detective (really a man of high family who has joined the "force" as a cure for ennui) pops the question, is accepted, and the two are made one in the last paragraph. This delightful romance has recently had its prototype in real life, proving the correctness of the old adage that truth, minus the embroidery, is every bit as strange as fiction.

The lady in the present instance is, or rather was, Miss Lilian Thomasch, of New York, who recently had a terrible experience in the Bronx, an outlying district of the city. She was walking one evening near 163rd street with a Mr. Charles Roxbury, whom she had known for fifteen years, when a negro stole up behind them and, with a heavy club, felled Mr. Roxbury to the ground. Miss Thomasch fled screaming and sought refuge in a house three streets away. Roxbury staggered home and died a few hours later without speaking.

As soon as the murder became known Luke F. Gordon, a policeman attached to the Tremont station, was sent to arrest Miss Thomasch, and during the week following he kept the young lady under surveillance, taking her many times to court to give evidence before the coroner and District Attorney Jerome. Gordon appears to have been immediately struck by Miss Thomasch's undoubted good looks and refinement, and though it was stated by the prosecution that she was withholding valuable evidence, Gordon always declared that she was hiding nothing.

When ultimately Jackson, the negro who had assaulted Mr. Roxbury, was caught, Gordon was again chosen as the one to conduct Miss Thomasch to and from the court house for the purpose of giving further evidence. Jackson was found guilty, sentenced to death, and finally electrocuted at Sing Sing. At the time of the murder Gordon's wife was living, but she died soon after the trial, and subsequently the policeman proposed to Miss Thomasch and was accepted.

Mrs. Gordon was "interviewed" soon after the wedding, when she informed a reporter that until she met her husband she always disliked policemen. "I never had a high opinion of police officers," she said, "and, in fact, was more or less prejudiced against them. Mr. Gordon was the most polite policeman I ever met, and he treated me with such unusual courtesy that I naturally fell in love with him, and now we are very happy."

AN INCIDENT IN ENGLAND.

There is at the present time in the British police force in the North an officer who first met his wife under circumstances which one would hardly expect to lead to the altar. This official was one day on duty outside a big department store, when a salesman dashed out and informed him that his presence was required in a case of shop-lifting. The young officer entered the shop, where he was commanded to arrest a modestly-attired young woman, who was accused of stealing a small piece of lace. She had

been searched and the property found on her, so there was nothing to be done but take her to the station. She looked so very young and appeared so frightened that the officer kindly dispatched a messenger for a cab, and into this he quietly bundled the young woman and conveyed her to the police-court, where she was duly "charged." It was conclusively proved that she had undoubtedly stolen the lace; indeed, she pleaded "guilty," but as it was a first offense she was given the "option" of a fine of £2 or a week's imprisonment. As the money was not forthcoming she was taken below, but half an hour later it was paid and the girl liberated with a caution.

It afterwards transpired that the policeman who had arrested her had paid the money, and as soon as the girl discovered this she made inquiries, found out where he lived, wrote him a letter of grateful thanks, and returned the money. In this way the acquaintance, begun under such adverse circumstances, ripened into friendship, and in less than three months the two were married—the alliance proving an unusually happy one.

AN INCIDENT IN THE UNITED STATES.

At one of the United States prisons the chief warden is married to a young woman who for three years was an inmate of the convict station. She had been charged with insurance frauds, and being found guilty was sentenced to imprisonment for five years in the "second degree." Though the evidence appeared to be flawless, there were many who believed her to be innocent, and these people were not surprised when, three years later, the mystery was cleared up by the confession of her brother, on whose behalf she had knowingly suffered disgrace.

Meanwhile, the warden, having taken an interest in the case, had managed to make her life a little easier in prison by granting her several trifling concessions, which she was not slow to appreciate. When the girl received her "pardon" it was the warden who read it over to her, and as he shook hands he told her that if there was any way by which he could serve her she was to let him know. The ex-prisoner took him at his word, and a few weeks later wrote asking permission to visit some of the unfortunate women whose acquaintance she had made during her imprisonment. Of course her request was granted, and the warden himself conducted her to the cells.

This was the first of many visits, and when, some six months later, the warden delicately hinted that she might be of even greater comfort to the prisoners if she would take up her permanent residence at the warden's house she consented to do so, and today she is the comfort and hope of hundreds of women and young girls who are doing various terms of imprisonment in the convict establishment over which her husband rules.

WOMAN OR MAN?

A remarkable case came before Mr. Francis at Westminster, in England, when a prisoner having the appearance of a little old man, described as Catherine Coombes, sixty-eight, painter and decorator, was charged with being drunk and disorderly.

Defendant was really dressed in male attire, and she carried a bowler hat and

small black bag. She made the statement that she had worked as a painter and on board ship, and had passed as a man for half a century.

Constable Grey said defendant, whom he believed to be a man, complained that "he" had lost his bag. Defendant was drunk, and was taken to the station, where she created much surprise by saying that she was a woman, and she added, "I've been a good woman, too, in my time" (laughter).

Prisoner: I was not drunk.

Detective Tanner said the police wished for a remand.

Mr. Francis: Yes. When an old woman is going about in man's clothes it is good ground for making further inquiry. It would be interesting to know whether she went to prison as a man or woman.

Prisoner was then remanded, and failed to find bail in £20.

The strange career of this woman is well known to the police. About four years ago she walked into Rochester row station (Westminster) attired as a man and smoking a briar-root pipe. She astonished the inspector on duty by announcing the fact that she was a woman who had been about forty-five years in male attire. She said that she had been known as Charles Wilson, and that she had worked on board ship. She had been married as a woman at the age of fifteen to one Percival Coombes, and very many years afterwards she married as a man a woman with whom she lived for fourteen years at Huddersfield. She also stated that she had found employment at the docks and in a printing office.

OHIO YOUTH HAS NEVER ALLOWED ANIMAL FOOD TO PASS HIS LIPS.

Dr. J. H. Kellogg, at Battle Creek, Michigan, physician in chief of a local sanitarium, who is one of the most noted advocates of vegetarianism in the world, has been gathering statistics and has discovered one person who has never eaten meat in his life.

The person is Hubert H. Bretz, a 16-year-old boy, of Celina, Ohio. Dr. Kellogg has received a letter from the boy's mother in which she says that her son has never eaten meat, chicken, turkey, oysters, or even eggs, the taste of which he does not know. He will not eat broths flavored with meat. From infancy he showed an abhorrence for meat. When a child the mother would put potato over a piece of meat and try to deceive him, but he always ate the potato and rejected the meat. When he grew older the mother attempted to hire him to eat meat, but to no purpose. All the rest of the family are meat eaters.

Contrary to the prophecies of the physicians that he would be sickly and delicate, he has enjoyed the best of health and has never been ill more than one week in his life. He is an athlete and fond of outdoor sports, being captain of the high school football team and the baseball nine. He is intelligent, a good scholar and has won many prizes as an elocutionist.

The boy weighs 140 pounds and is five feet eight and one-half inches in height. He has never had any of the illnesses incident to childhood, such as measles, whooping cough, etc., while his sister, who is eleven years old and a meat eater, has

had all of these diseases, and he remained in the house with her all the time.

There are many non-meat eaters in the world, but all others gave up eating meat after reaching a certain age.

Mrs. Bretz, the mother, writes that the boy's diet is principally potatoes, which must be cooked without grease. Mashed or baked is his favorite method of preparation. He could eat potatoes three times a day and never asked for anything else. He eats plenty of bread and navy beans. He cares nothing for pastry and eats little fruit.

A RUSSIAN HORROR.

The town of Blagoviestchenk has attained unenviable notoriety by the epidemic of crime which raged there during March and April of 1904, and which culminated in the following horror:

A tailor named Ruibnikoff, of Kalmuck origin, had for a long time been subjected to persecution on account of his curiously Japanese appearance. Twice when innocently walking on the banks of the Amour, he had been arrested by Russian sentries as a spy; and these blunders gradually created a genuine belief that he was in Japanese pay. Besides this his windows were broken, his children boycotted by their schoolfellows, and one evening he was seized by masked men, stripped and ducked through a hole in the ice.

Finally, the tailor's house was set on fire and the unfortunate man went out of his mind. His landlord, fearing the loss of his property, gave Ruibnikoff notice; other landlords refused to let their houses to such an undesirable tenant, and at last the whole family was turned out homeless into the street.

Secretly they sought shelter in the town hall. When the caretaker returned at night he found the door barred, and, hearing voices inside, summoned the police to help him to break in.

A large crowd collected in the street. Just as the door was yielding a child's body came hurtling through the air, and fell with a thud upon the pavement. Horrified, the people looked up and saw the demented tailor force his son of eleven over the parapet. Then in quick succession were hurled to death an eighteen-year-old daughter, a baby son, and Ruibnikoff's wife.

Having at last gained the roof, the police seized the murderer, but slipping his coat, Ruibnikoff with a great spring cleared the parapet and fell headlong in the middle of the street.

A MAGNETIC STORM.

As the British ship Mohican made for the Delaware breakwater July 31, 1904, it encountered a strange phenomenon. A cloud of phosphorus enveloped the vessel, magnetizing everything on board. Captain Urquhart tells the story and the crew vouch for the details.

"I noticed a strange gray cloud at a distance, and watched it as it came closer. The vessel and crew were given a fiery coating before the sailors saw it," said the captain. "They rushed about the deck in consternation. I looked at the needle and it was flying around like an electric fan. I ordered several of the crew to

move the iron chains lying on the deck, thinking that it would divert their attention.

"But the sailors could not budge the chains, although they did not weigh more than seventy-five pounds. Everything was magnetized, and chains, bolts, spikes, and bars were as tight to the deck as if they had been riveted. The cloud was so dense that it was impossible for the vessel to proceed. I could not see beyond the decks, and it appeared as if the whole world was a mass of glowing fire.

"The frightened sailors fell on the decks and prayed. The hair in our heads and beards stuck out like bristles. We noticed that it became difficult to move arms and legs.

"Suddenly the cloud began to lift. The phosphorescent glow of the ship and crew began to fade. Gradually the magnetism of the steel died. At the same time the stiffness left our hair. In a few minutes the cloud had passed over the vessel and we saw it move off over the sea.

"I never before encountered a cloud like that. It must have been composed of some magnetized substance which was combined with phosphorus."

INSANITY COMMUNICATED BY A LUNATIC.

Apparent proof that insanity may be communicated, like hydrophobia, is shown by a case which attracted much attention among physicians at Bellevue hospital. The subject, Nellie Halpin, a trained nurse, was bitten on the hand by an insane patient in the Kings County Sanitarium.

After that the wound frequently gave Miss Halpin great pain and never completely healed. About two months later she began to show signs of mental disturbance. These grew longer, and finally her friends had the young woman removed from her home to the hospital. She suffered severe convulsions resembling the manifestations of rabies, while the mental delusions were almost continuous till her death.

STRANGE TRAGEDY OF OLD MEN.

John Gomersoll, aged about eighty, met James Brennan and Henry Gould, both over seventy, and blind, in Kewanee, Ill., and accepted their invitation to spend the night with them at their home in the neighboring village of Neponset.

The three old men had been acquainted for many years. So far as known, the relations between the two blind men and Gomersoll had been entirely friendly. The village marshal of Neponset, passing the blind men's house that evening, saw the three engaged in conversation and apparently on the most friendly terms.

About 4 o'clock the next morning Brennan aroused a neighbor, saying that he and Gould had captured a burglar in their house. On reaching the place the neighbor found Gould sitting on a chair, under which lay Gomersoll, his hands tied, and so severely injured that he died without being able to tell his part of the story.

The two blind men persisted that they took their guest for a burglar, and set upon him in that belief. The coroner's jury, not unreasonably in view of the strange circumstances, held Brennan and Gould to the grand jury, and they were lodged in jail at Kewanee.

Whatever the courts may find to be the facts, upon any theory of them, the case is certainly one of the strangest in crim-

inal annals. Four explanations naturally suggest themselves:

Gomersoll may have attempted to rob his hosts and been caught in the act. He may have arisen in the night for some innocent purpose and had his intentions fatally misunderstood by his sightless companions. Or he may have been the victim of a secretly cherished enmity, of which the cause was so old that he had forgotten if he ever knew it, but which had finally entrapped him to a long meditated revenge. Or some trivial quarrel may have brought the tragic conclusion.

Whatever the truth, the novelist who should draw such a scene as that deadly midnight struggle in the darkened house between three old men on the brink of the grave, and two of them blind, whether he ascribed to them motives of fear, or hate, or greed, or represented their conduct as motiveless and merely the product of error, would find his picture discredited by most readers as horribly impossible.

Yet what would be disbelieved if presented as fiction is merely bald fact recorded in the ordinary commonplace police annals of an Illinois country town. That truth is indeed stranger than fiction would ever dare be is again illustrated by Neponset's strange tragedy.

KISCHENEFF MASSACRE OF JEWS.

During the Easter holidays of 1903 the massacre of Jews at Kischeneff, Russia, which shocked the civilized world, took place. At least sixty were killed and over a hundred wounded. In addition, a considerable part of the Jewish quarter of the city was wrecked by bloody rioters. Deeds of appalling cruelty were perpetrated.

Large sums for the relief of the surviving victims were raised, most of the contributions coming from the United States.

In behalf of Americans, the B'nai B'rith Order formulated a petition to the Czar and asked the United States Government to transmit it through diplomatic channels. Upon inquiry, the Russian Governernment declined to receive it on the ground that it would be interference in the internal affairs of the Empire. The petition sets forth that the Jewish victims were attacked from race and religious prejudice; that the local officers were derelict in the performance of their duties; that millions of Jews—Russian subjects—dwelling in southwestern Russia are in constant dread of fresh outbreaks; that the westward migration of Russian Jews, which has proceeded for over twenty years, is being stimulated by these fears, and already that movement has become so great as to overshadow in magnitude the expulsion of the Jews from Spain and to rank with the exodus from Egypt.

After trial, only comparatively short terms of imprisonment were given the persons accused of complicity in the Kischeneff massacre.

REMARKABLE FAMILY STRIFE.

The strife and discord of a family divided against itself was disclosed in Judge Holdom's court room in the evidence introduced by Mrs. Constance Richardson, in a fight for the right to visit her children. Mrs. Richardson's brother, Wil-

Turkish troops reoccupying a Macedonian village after routing the insurgents. "The Cross descends, thy Minarets arise." View of Turkish massacre of Christians.

liam Pelham, took the stand and testified as to the unfitness of his sister to visit her children, who live with their father, William Richardson, from whom she is divorced.

Her story declared that she had been supplanted in her husband's affections by her own sister, Agnes, whom Richardson took on trips with him to Milwaukee and other cities. It declared that since Mrs. Richardson's cousin, Miss Frances Richardson, had supplanted both, and is now keeping house for Richardson on the South Side.

ENTIRE FAMILY IN FEUDS.

It showed a father condemning a daughter, whom he termed "villainous," and a son-in-law, whom he called a "scoundrel." It showed sister fighting sister, brother fighting sister and father, father fighting son and daughter, and wife fighting husband in the divorce court.

This remarkable state of affairs was brought to light as the result of a series of eight letters written by the elder Pelham while the Richardson divorce trial was in progress and just before he killed himself over the differences which parted the Richardsons.

Mrs. Richardson introduced the letters to refute the testimony of her brother given last week. It was set forth that her brother was against her because Mrs. Richardson in a dispute over their mother's estate some years ago had maintained that her father should be given $15,000 which the will directed.

CALLS BROTHER AN ENEMY.

"Your brother is your enemy as he is mine," ran a letter Pelham wrote to his daughter from Albany, N. Y. "As for me, he is welcome to remain so to the end."

Other letters written by the elder Pelham to relatives from Des Moines and other places gave an insight into Richardson's life while the divorce case was pending.

"I have an anxious duty to perform here," said one Des Moines letter, "trying to get witnesses together for my daughter's case, which comes off soon. It is simple justice to a poor, persecuted daughter, who has a scoundrel of a husband and a home broken up by a villainous sister, Agnes.

"I denounce the daughter who is wrong for the one who is right," was another abstract read.

To Mrs. Nellie Thatcher of Boston the elder Pelham wrote:

"Richardson went to Chicago recently and took Agnes to Milwaukee and other places. I have his movements down to a fine point. He has sent me word my son will take the stand and prove me the worst man in Des Moines. I say let him come."

WOMAN ASSERTS POVERTY.

Instead of being able to afford such luxuries as paint and powder and high French heels, Mrs. Constance N. Richardson asserted to Judge Holdom that she had often been at the point of starvation, and that she had to depend upon the charity of her friends to get food. Six hours Judge Holdom listened to testimony produced by Mrs. Richardson to show that she is a proper person to be allowed the privilege of seeing her three children.

She also denied the statements of another witness against her to the effect that she used paint and powder in great quan-

tities, and wore French high heels that were "vulgar."

USE OF COSMETICS DENIED.

Several of Mrs. Richardson's friends were in court to swear that she never used cosmetics to excess, as also to tell of their high estimation of her character. As for the high heels, Mrs. Richardson was prepared to deliver a broadside. She had an "expert" on hand who was to explain to the court the difference between heels that are vulgar and those that are not. But Judge Holdom headed this testimony off by declaring that since the last hearing of the case he had conducted a private investigation and was well versed in up-to-date feminine foot toggery.

PSYCHIC PHENOMENA.

A sermon preached at the East Broadway United Brethren Church of Detroit, July 31, 1904, by its regular pastor, the Rev. W. C. Shupp, one of the city's most substantial and conservative ministers, has created a tremendous sensation. His subject was: "Revelations from the Lord through Ernest Case."

Case, it will be recalled, is the man whose spiritual visions startled press, pulpit and public alike during the month of July. He said in part:

"The vast panorama of heaven and hell God has permitted Ernest Case to gaze upon. I have tested this man in every conceivable manner. He never misses anything in general and seldom a minor detail. He is not a religious fanatic, and never took much interest in religion. His warnings from visions were terrible—horrible. He thoroughly destroys and precludes every argument that would indicate this phenomena could be attributed to any other than divine causes.

DIRECT MESSENGER OF GOD.

"I am forced to believe that God has drawn a veil over the five senses of this man, temporarily, and developed his spiritual sense in such a manner that he speaks as the direct messenger from God. I tested him, a plain, uneducated man, carefully. With eyes closed, so ill he could not rise from his bed normally, I would cause the Bible to be removed from beneath his pillow and hidden in dark, out-of-the-way places. Suddenly, with eyes closed, he would point to me, or whoever took it, slowly rise, walk with eyes closed direct to where the Bible was hidden, seize it, mutter a prayer, then collapse.

"I am in a hard place this morning, but must do my duty. What I saw, what others saw, we must believe. He can tell what and who a visitor is as soon as he comes near the house. He read to me revelations of past lives of many whom he did not know till I begged him to desist.

"He is calm, cool and collected. He says he is always guided by two lights which lead him.

DESCRIBES HEAVEN AND HELL.

"He told many visions of heaven and revelations of hell. The latter place is where the victim is kept in a constant terror of some terrible danger—no literal fire. He receives and translates wonderful messages. He says—and I am now convinced it is true—that God has selected

this man of all to warn the world to repent.

"He told wonderful things of the planets and their past. His ability to find that Bible surpasses all knowledge. He can read the most abject stranger at once through and through and has revealed some startling local characters."

Pastor Shupp also stated that he made a careful investigation of the man's early history and his every-day life. Case is general foreman for the Massillon Bridge Company. Among other big contracts of which he had charge was the Eads bridge at St. Louis.

MOST WONDERFUL MAN.

"Here," said the minister, "his employers inform me that they were astounded at the work of the man. He had under him about 150 of the hardest men to control that were perhaps ever together on one piece of work. He had absolute control over them and never had occasion to reprimand them.

"But the most wonderful feature of this job was that, when the plans were shown him at the office, he looked them over carefully and never again referred to them, not even footing up long columns of measurements and adjustments. This all came to him in some unaccountable manner through the entire contract.

"Ernest Case declares 'the judgment will not come in this generation, but that it will not be many years, and that sin will increase until this planet will be burned out as have been the moon and sun, so vile did they become.

"Case regards universalism and hypocrisy as the great error and crime of the world. An angel told him that.

TELEPATHIC COMMUNICATION BETWEEN A WELL-KNOWN AUTHOR AND HIS DOG.

A NOVELIST CLAIMS TO HAVE WRITTEN A NOVEL COMMUNICATED BY A SPIRIT.

Rider Haggard, the novelist, has raised the interesting question of telepathic communication between men and animals in a long letter to the Times. He describes how on the night of July 9, 1904, his wife roused him from a nightmare, a dream that a black retriever dog belonging to his eldest daughter was lying dead in water beside some brushwood. The dog was trying to speak to him, and, failing, transmitted to his mind in some undefined fashion it was dying.

The next night the dog was missed. Four days later it was discovered in a river a mile away. It evidently had been killed by a train on a railway bridge. Other evidence shows that it was killed at exactly the hour of his nightmare. Rider Haggard does not attempt to explain the phenomenon, which is being considered by the Society for Psychical Research.

LIVED IN ANCIENT ROME.

Another novelist, Mrs. Campbell Praed, is also puzzling the occultists by averring that her latest novel, "Nyria," is a revelation of a young unmarried woman who remembers her previous existence, nearly 2,000 years ago, as a martyr under Domitian. Sitting together in a hotel in a foreign country, Mrs. Praed held the girl's hand. Then the girl would go into

a sort of dream existence. She assumed a different identity, and spoke of scenes and events of which she had not the slightest recollection when she returned to normal consciousness.

By chance during one of these dreams the conversation turned on old Rome, and the girl, sinking back in the chair, with her eyes closed, told an amazing tale about experiences in a former existence.

GIRL RECITES STORY.

"The girl," says Mrs. Campbell Praed, "was Nyria, and the story is Nyria's, not mine. I could not have invented it, could not have supplied the detail and local color, which experts pronounce perfect.

"She knows no language but English, yet she gave with absolute accuracy the titles of various princes and functionaries about the court—titles which, so far as I know, have only appeared in a book which never has been translated into English."

NOTED POET-DRAMATIST HAS EXPERIENCES.

Stephen Phillips, well known poet-dramatist, author of "Paolo and Francesca" and "Herod," has been having an experience which he thinks the Psychical Research Society should set about investigating. Mrs. Phillips recently leased a detached house in Engham, a sleepy up-river town near Windsor.

"I went there for peace and quiet," he said, "and yet, although many people knew my purpose, nobody had the pluck to tell me that the place had the reputation of being haunted.

"We found it out pretty quickly ourselves. My household and I no sooner had been installed in the place than the uncanniest noises conceivable beset us. There were knockings and rappings, footfalls, soft and loud; hasty, stealthy hurrying and scurryings and sounds as of a human creature being chased and caught and then strangled or choked. Doors banged and were opened and closed unaccountably, as if by unseen hands. I would be sitting quietly in the study, writing, when the door would open soundlessly. That in itself was enough, in the dead of night, to a man with his imagination aflame. It was susceptible of explanation, however. 'It is only a bit of a draught,' I would say to myself as I held my breath and watched. But draughts don't turn door handles; and, on my life, the handle would turn as the door opened, and there was no hand visible.

"This happened repeatedly. All the household heard the sounds and experienced the same sensations.

"My little daughter reported having seen a little old man creeping about the house, but there was no such person to be found.

"In light of the story I afterwards heard, this is important. What was the story? Well, all the details are unprintable, but it is common property in Engham, and the Psychical Research Society, if they believe in ghosts, will doubtless find that incidents of it dovetail suggestively into our experiences.

"What you can say is that, according to common report and local tradition, an old farmer strangled a child fifty years ago in the vicinity of our house at Engham. This tradition I learned, mind you, after, and not before, the experiences.

"If there really is a ghost on the prowl it explains a lot.

"Needless to say, we threw up our lease of the residence and got out of it like a shot. The servants left so precipitately that they did not even take their boxes, and so you may imagine how scared they were. The house has not had a tenant since, and I learn that before my advent it rarely, if ever, was occupied.

"A man of reasonable intellect, I am open to any reasonable explanation of our experiences. Indeed, the house continues 'to let,' and is still reported to be haunted. I should be quite glad if some respectable body, such as the Psychical Research Society, would endeavor to clear the matter up."

MIRACULOUS STIGMATA OR LIGHTNING-MADE PICTURE.

Abbott Parker, a painter by trade, was walking along the streets of Morristown, N. J., during a severe thunder shower.

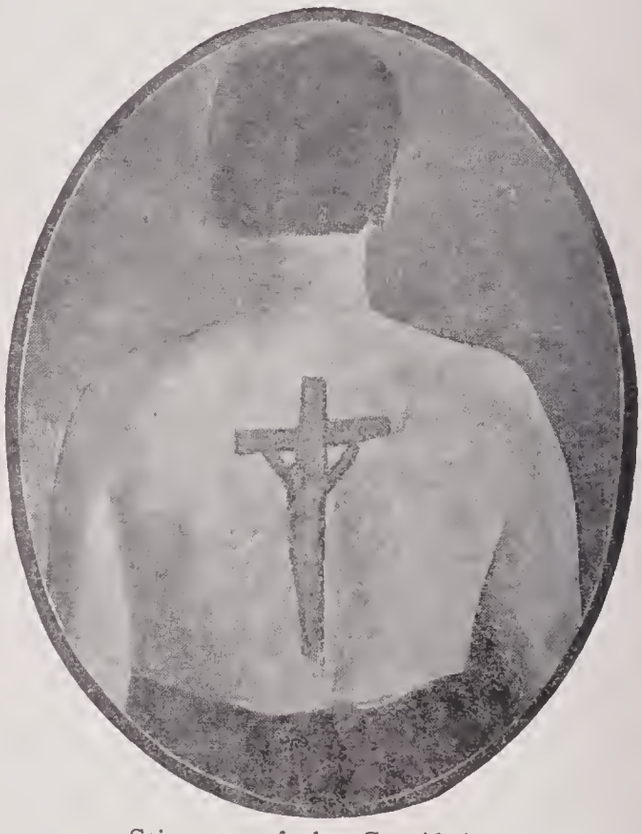
As he reached Mount Kemble avenue and stopped beneath a huge maple tree a broad sheet of lightning stretched over the sky, a deafening peal of thunder followed, and those watching the storm from the windows of their homes noted that Parker had fallen and was lying, apparently unconscious, in the ditch at the roadside.

He was picked up and carried to the home of Theodore Armstrong. Medical aid was summoned, and Parker was removed to All Souls' hospital and placed under the care of Dr. J. B. Griswold.

An examination disclosed an extensive burn on the back, which, at the time, resembled an ordinary burn similarly caused. The surface of the back above the waist was covered with pink blotches, but there was hardly a line visible.

STARTLING DISCOVERY.

Shortly afterward the Gray Nuns of the hospital were bathing the burned surface of Parker's back in alcohol and water, when they were startled to find that there was appearing, as though beneath the skin, a picture of the crucifixion drawn in lines of livid red. And even while they watched and marveled the drawing took



Stigmata of the Crucifixion.

definite form and appeared as a miracle before their eyes.

They sank to their knees in prayer, convinced that the presentiment was no less than a modern miracle wrought to strengthen the faith of weaklings and doubters. They summoned the mother superior and the physician and all noted the phenomenon.

Dr. Griswold was at first of the opinion that the picture had been tattooed upon the back of the man. But during the excitement caused by the strange appearance an expert tattooer was employed to make an investigation and he emphatically announced that the picture was not the result of tattooing. Parker, also, though he refused to give the story of his life in detail, denied that he ever had submitted to the needle and the pigments of the skin decorators.

And so the phenomenon remains unexplained. Numerous explanations have been advanced and refuted. Above the bed on which Parker has been lying since having been taken to All Souls' hospital, is a sculptured presentment of the crucifixion which in general outlines has appeared in duplication upon the burned back of the man. But this coincidence does not in any way lesson the mystery.

The Gray Nuns, who conduct All Souls' hospital, where the man is lying, are satisfied that one of the most remarkable miracles of modern times has been worked before their eyes. Scientists will seek an explanation, but so far none has been found which will be generally believed.

The man's skin where the picture appears is not raised, as it would be if a hot iron had been applied, but is smooth and even with the surrounding sallow skin.

Here and there a bit of skin where the picture appears has begun to peel off, but the picture itself is as distinct and clear cut, its details are as perfect and exact as when the Gray Nuns who were bathing the injured man's back were startled to see an image of Christ upon the cross appear before their eyes.

How long the picture will remain in its present form no one who has been connected with the remarkable case cares to predict, but so far it has given no evidences of a tendency to disappear or even to fade.

Scientists who may try to explain the phenomenon from the fact of the near-by crucifix, of which the picture upon the man's back might be a somewhat distorted photograph, will find it almost as difficult to solve the mystery as if the crucifix did not enter into the case.

HOW IT HAPPENED.

Parker was struck by lightning as he stood beneath a large maple tree, under whose branches he had sought shelter. His clothes were partly torn from his body, and when he was picked up it appeared that his back had been burned severely.

At least thirty minutes passed from the moment when Parker was struck by lightning before the picture began to be visible, and it did not appear at all until after he had been lying on a bed in the hospital with the crucifix hanging directly above his head.

A PHOTOGRAPHIC THEORY.

Scientists will attempt an explanation by declaring that the man's skin had become sensitized by the lightning, and when exposed to the crucifix, which was the most prominent object near where he lay, acted as a slow photographic plate, but photographers will suggest that sensitized plates will not take a picture without the aid of a lens, and in this instance there is nothing which can correspond to a lens.

On this point Dr. Griswold, the physician who has had charge of Parker, is as

much at a loss as would be one who knew of the phenomenon merely by hearsay.

"The man's back was not exposed to the crucifix for any considerable time," said Dr. Griswold. "When he was taken into the hospital and laid upon his bed he lay at first on his back. As he was being bathed he was turned more or less from side to side, but I do not think that he was at any time laid directly upon his stomach.

"From the first I have maintained that the picture was not the result of tattooing, but of course I have no expert knowledge on the subject. Now that the experts have seen my patient and have said positively that no tattooing has been done, my belief is, of course, confirmed.

"There are so many mysterious factors in the case that one can only accept the facts as having occurred and admit that the explanation of them is beyond him. Of course, the lightning is responsible, but how it wrought this miracle is another matter entirely, and one which I shall not attempt to explain.

"All I know is that when I first saw the man, a few minutes after he had been struck, there was not a sign of anything except what appeared to be burns, and that it was several hours afterward before I was notified that the picture of the crucifixion had appeared on his back.

"What saved the man's life undoubtedly was the fact that he was wearing a rather heavy coat, which had become soaking wet. When the bolt of lightning struck him the water in his coat proved so good a conductor that most of the electricity was carried down the coat, and thence to the ground. Otherwise it is probable that he would have been instantly killed."

ONE WHO SAW THE BURN.

Mrs. Katherine Rickett was one of the first to see Parker after he was struck by the lightning and carried to the piazza of the house of Armstrong. She had not heard of the picture of the crucifixion appearing on the man's back when she was seen, and expressed incredulity that such a thing could have occurred.

"Why, there was nothing of the sort when I saw the poor fellow," she said. "His back was burned, to be sure, but the burn was all over it in little pink spots. There was hardly a line in it, to say nothing of a cross."

There is not to be seen anywhere near the spot where Parker was struck any object which the lightning could have photographed on his skin at the time the bolt fell. On the opposite side of Mount Kemble avenue there is a pole carrying twenty-six telephone wires, and if a cross alone had appeared on the man's back it might have been explained as having come from an arm on the pole crossed with the pole itself.

Parker himself is as much at a loss as any one else to explain the mystery. He remains extremely reticent as to his past, but sturdily insists that he never has been tattooed. Questioned as to whether there has been any occurrence in his past life which, in his opinion, might be responsible for the working of what appears to many to be a miracle, he remains silent.

In fact, the man appears to be deeply depressed over the phenomenon of which he has been the subject, and the nervous strain is telling upon him severely. He

A Tibetan "Booby-Trap"; an Unpleasant Surprise in the Karo Pass.

In reconnoitring the Karo Pass, some forty-nine miles from Gyangtse, on the road to Lhasa, a party of Sikh Mounted Infantry had a narrow escape from a Tibetan "booby-trap." This consisted of a mass of carefully balanced stones and rocks, placed on the heights above the pass, which were released and shot down the hillside when the English soldiers were passing below. Fortunately no one was hit.

admitted that his home is in Charlestown, Mass., and that he has left his parents on several occasions without letting them know his whereabouts, but further than that he will not go.

"There's nothing of any interest about me, anyway," he said. At the house where he has been boarding under the name of Wilmer nothing further could be learned about Parker, except that he said he was a painter and that he was anxious to obtain employment.

Aside from his nervousness Parker's condition is by no means critical, and it is probable that he will be able to leave the hospital in a week or ten days at the most. When first taken to the hospital he was besieged by callers, who were anxious to see the picture upon his back, and finally he became so exhausted nervously that Dr. Griswold had him removed from the men's ward on the ground floor to a private room on the floor above, where his condition has steadily improved.

OTHER SIMILAR CASES ON RECORD.

Although the photographing of an object upon the human skin by a stroke of lightning is not unique, it is of extremely rare occurrence, and the instances reported in this country number less than a score.

In one respect, however, the case of Abbott Parker appears to differ materially from any of the others which have been recorded. In his case the skin seems to have become sensitized in such a way that half an hour later the image of a crucifix hanging above his bed in a hospital ward was transferred to his back, while in the other cases reported the phenomenon was instantaneous, the picture appearing on the skin immediately after the lightning struck, or at least being the image of some object which was near the person who was struck, such as a twig, a leaf from a tree beneath which he was standing or occasionally the picture of an entire tree.

PHENOMENON LESS FREQUENT.

Of recent years the instances of this phenomenon appear to have been less frequent than in the past, or it may be that more careful investigation has eliminated all but the authentic cases.

Miss Della Moncrief was struck by lightning at South Framingham, Mass., on August 5, 1882, while sitting on the piazza of her residence. She was not severely injured, but after she recovered from the first shock the perfect picture of an elm tree that stood near the house was found burned upon her back.

Lightning struck the house of Dr. White in Fishkill, N. Y., on July 22, 1892, and entered the butler's pantry. On a shelf in this pantry, four feet from the floor, stood several royal Dresden plates decorated in colors. After the storm, on the wall of the closet were found, in circles corresponding to the size of the plates, good copies of the ornamentation on the crockery made by the lightning.

SOME OTHER INSTANCES.

William Campbell was killed by lightning on September 4, 1896, while standing at the door of his home near Yonkers, N. Y. The bolt uprooted a small shrub just in front of him, and a twig with leaves on it was knocked off. When Campbell's body was prepared for burial a perfect reproduction of this twig was found imprinted on his breast.

The shrub was about six feet high and grew about sixteen feet from the spot where Campbell was standing when he was struck. The picture of the twig was exactly fourteen inches long and in bright red color. It was then said that only eighteen previous cases of lightning photography had been recorded in this country.

John Phalen was struck by lightning at Livonia, N. Y., on June 26, 1900. On his side just over his heart was a red spot with a black cap. From this radiated a dozen bright red streaks like the spokes of a wheel and running down about fifteen inches. He was unconscious for half an hour after he was struck.

A REMARKABLE MAN AND THE LAW SUIT OF HIS HEIRS.

Suits for the recovery of a vast fortune, instituted in Omaha, recall the career of the most remarkable man in many ways that America has ever known—George Francis Train, who boasted that he was the only duly licensed lunatic at large in the entire world.

When Train was constructing the Union Pacific railroad in 1865 he foresaw the growth and future importance of Omaha, and purchased approximately a square mile of land along the Missouri river in that city. At that time the land was not improved, but it has since become the heart of a populous district, with a value of $30,000,000.

During the events that led up to the celebrated Beecher-Tilton trial in 1874 Train was declared of unsound mind by the courts. This decree was never revoked. Subsequently the land in Omaha was sold on account of failure on the part of Train to pay the taxes. The heirs, who have entered suit, now assert that the sale was made without due process of law, it being necessary when the owner is of unsound mind to have a guardian appointed for him before such a transaction is legal. This was not done.

The achievements of Train were as marvelous as his eccentricities were pronounced. He founded the clipper ship line that sailed around Cape Horn to San Francisco, and caused American shipping to lead the world. He organized the Credit Mobilier and the Union Pacific railroad, built the first street railway in England, and was the business partner of queens, emperors and grand dukes.

He was one of the inspiring forces of the French Commune, from which he took his title "Citizen." He made more than seventy ocean voyages, and broke the record for time around the world in three instances. He was in jail fifteen times—from the New York Tombs to the Paris Bastile—notwithstanding that he never committed a crime.

Six courts declared Train to be insane. For fourteen years, toward the close of his life, he never spoke voluntarily to a man or shook hands with one, devoting himself exclusively to children. Grown persons robbed him of his "psychic force," he said.

At one time Train lived in a magnificent villa and spent more than $2,000 a week in maintaining it. His declining

years, however, were spent in the Mills hotel, New York, with a total expenditure of $3 a week. Although he made millions, he was practically a pauper when he died.

George Francis Train, "Citizen of the World," died in New York, January, 1904. A short time before, he had recorded this opinion of himself:

"How can a peanut convention know about a cocoanut? The people who compose it have never seen a cocoanut. They don't know what it is. The peanut convention considers the cocoanut, deliberates wisely and passes a resolution that the cocoanut is a large peanut. And how can the cocoanut find out what it is until it sees another cocoanut like itself? I am a cocoanut. The other people are peanuts."

STRANGE VICISSITUDES OF A MAN WITH A DOUBLE.

There is today walking about London, still on bail but soon to be entirely free, an innocent man whose disgrace and seven years' penal servitude and unspeakable moral tortures amount to the irrefutable indictment of English celebrated modern judicial methods.

The extraordinary case of Adolf Beck will become in England the classic example of the inadequacy of the strongest circumstantial evidence, of the almost criminal futility of the testimony given by "hand-writing experts," of the absolute unreliability, in serious cases, of the most persistent and unhesitating personal identification.

Incidentally his terrible story shows that in real life there do happen amazing coincidences which would be scouted in fiction, and that the arbitrary power we call luck does in fact play a formidable part in human affairs, now suddenly bringing a man to utter ruin, now suddenly and inexplicably setting him on his feet again.

IDENTIFIED BY MANY WOMEN.

In view of the fate of Adolf Beck it will become almost impossible to convict a man unless he be caught red-handed in crime. Already this case is being coupled with Mrs. Maybrick's as proof that justice is still often blind.

In December, 1896, Adolf Beck, walking in the evening in the Westminster district, was addressed by a woman who exclaimed in a menacing tone, "I know you!" He passed on hastily, but the woman dogged him down the street. Beck spoke to a policeman. The woman promptly accused him of having robbed her of two watches and a ring. He was arrested.

Women from all over London came forward and identified him as having robbed them of jewelry or money. According to their evidence the prisoner had passed himself off to each of them for a peer, immensely rich, and anxious to take them round the world on his yacht, or to establish them at one or other of his castles or manors in the country. Sometimes he would write them a heavy check —bogus—taking from them, say a hundred dollars, on the pretext that he had run out of cash "and the cursed banks are all closed, don't you know." Sometimes he would borrow a ring, to be a guide to him in selecting the right fit in

the superb "engagement ring" to be purchased next morning before the pair set out on their little expedition.

MANY WITNESSES SWORE TO HIS IDENTITY.

The women were absolutely unhesitating in their recognition of the man; the case became still stronger when the prosecution put in the box a witness, an ex-police sergeant, who testified that nearly twenty years ago he had arrested the prisoner for the same offense, and that Beck had then been convicted under the name of Smith and had served five years' penal servitude. This seemed conclusive, but Beck in face of all maintained his absolute innocence. With such force and intensity of passion did he voice his indignation as to shake the judge's mind. The sergeant was called back. "You are an old man," the judge put it, "and you want to go happy to your grave. Do you swear to this man?"

And the old man swore: "Without the shadow of a doubt I took this man into custody twenty years ago!"

A handwriting expert testified that the writing of the convict Smith was absolutely identical with that of Adolf Beck; no two men could write so exactly alike by mere chance. This was damning.

Beck tried in vain to establish an alibi. In the year 1877 he had been in Peru, and at the time of some, at least, of the robberies now charged against him he was in Norway. It was of no avail. He was sentenced to seven years' penal servitude. As he was removed to the oblivion of the cell he protested loudly that a hideous injustice was being done. In prison he still affirmed his innocence; he told the chaplains and warders that when he should be free he would hunt the streets of London day and night for the clue that would enable him to prove himself an upright man. And he added: "Day and night I pray to God to make my innocence manifest, and I know—I do really know—that my prayer will be heard—has been heard. Sooner or later the world will recognize that I am a much wronged man, victim of a terrible series of mischances."

BECAME A BLOODHOUND MAN.

When his time was served and he was free he kept his word. He became a prowler day and night in hideous places, "a bloodhound man," he said, determined to track down the infamous wretch for whose horrible crimes he had suffered disgrace and agonies and the shattering of his life.

His solicitor of 1896 believed in him implicitly, as Lord Russell maintained the innocence of his client, Mrs. Maybrick. The well-known journalist, Mr. George R. Sims, who at the time of the conviction had written impassioned columns in his favor, was faithful and indefatigable in help and encouragement.

Then another, an inconceivably terrible blow fell on him. In April, 1904, Adolf Beck was arrested again. A woman meeting him on the street demanded from him her watch and chain. Again he was brought to the police courts. Again other women came forward and identified him: "That is the very man that swindled me!" Now many of his friends abandoned him; this was too much for human belief. Once in a man's life this thing might happen—twice, no! That was beyond the limits of possibility.

Still courageous to the end under this bitterest fate that could befall any man, Beck made the country ring with his passionate protestations, appeals, cries for investigation.

The evidence was appallingly strong. Scarcely any one could have any doubt that this man was the most brazen-faced criminal as well as one of the most loathsome specimens of degraded humanity that ever fell into the net of justice.

None the less there was a fervor, a convincingness" about the man's affirmations that made the judge hesitate. Mr. Justice Grantham, against all precedent, deferred sentence to the next session.

In the nick of time there came a surprising development. There was a dramatic appearance that changed all the face of the case, as dramatic as any in all the records of justice.

HIS DOUBLE FOUND AT LAST.

Recently there was put into the dock a prisoner calling himself "William Thomas, journalist," to answer the charge of feloniously obtaining jewelry from two women.

In every detail of method and pretext it was exactly a repetition of Beck's crime. And the prisoner was exactly Beck's "double."

The same heavy gray hair, the same thick gray military mustache, the same firm chin, eyebrows densely shaded and arching after the same line, the same rather full, well-fed face. The only difference was in the line of the nose, and this was scarcely to be noticed except when the faces were carefully scrutinized in profile.

There was no reasonable doubt that this new prisoner, who refused all details of address, connections, etc., was the man for whose hideous infamies Adolf Beck had suffered a veritable hell of torture and the deepest depths of ignominy, the man who in 1877 served the richly deserved five years' penal servitude wrongly attributed to Adolf Beck.

Was there ever a more amazing case of the duplication of personal appearance? It is to be noticed that the doubling was not the relatively common case of one man at one given moment resembling another or in any one year of life. Here the resemblance had persisted year by year during twenty-seven years. "The man who was like Beck in 1877 is like him today, as he was like him in that fatal 1896. Until the death of one, it would seem, neither would be safe from the consequences of any crime of the other.

Immediately on the discovery of the startling similarity Beck's freedom was a foregone conclusion. The public conscience demanded his immediate release and nominal bail was at once taken.

A REMARKABLE DECISION ON CHURCH PROPERTY.

The British House of Lords sitting as a High Court of the Kingdom for Scotland recently rendered an extraordinary judgment. On Sunday, August 7, 1904, the pastors of 1,100 churches of what is known as the "United Free Church" of that country read to crowded congregations a manifesto, which has been described as "of the nature of a death warrant." The purport of it was that they

have no right to the pulpits they occupy.

Nothing has created a greater sensation north of the Tweed, since what is known as the great disruption of 1843, than the decision in the appeal case against Lord Overton and the other trustees of the funds of the Free Church. Two formerly separate church organizations in Scotland, the Free Church and the United Presbyterian Church, came together in a union organization in 1900 under the common designation of the United Free Church of Scotland. The action on the part of the old Free Church was not unanimous. Twenty-seven of the Free Church ministers, mostly hailing from remote and obscure Highland churches, stood out in opposition to the union and failed to sanction it. These men were ultra-Calvinists, unaffected by the liberalizing tendencies of modern theology. They belonged, in fact, to Jonathan Edwards' era of orthodoxy. The large majority of the ministers, however, had got far away from that school of thought. Between them and the ministers of what has been known as the United Presbyterian Church there was essential agreement in faith and doctrine and a cordial sympathy. These conditions brought about the federal union lately accomplished. It was commonly regarded by the Protestant denominations of Great Britain and the United States as a wise and useful step, tending to the honor of religion and the welfare of the people.

SMALL REMNANT GREATLY ENRICHED.

If all the Free Church ministers had entered into the arrangement there would have been no such trouble as has arisen. Those who did enter into it of course abandoned the Free Church. There remained a small remnant which continued to be the Free Church. As an independent body the Free Church had a large property, consisting principally of churches, parsonages and endowment funds, which belonged to the church organization as a corporate body, not to the individual church or parish. The majority who abandoned the Free Church and joined in creating the new church organization presumed to carry off with them this property and convey it practically to the separate church they had established.

The twenty-seven clergymen and their flocks, who still constituted the Free Church and continued its existence, made a protest. What they said in effect was that the ministers themselves had a personal right to abandon the Free Church and set up any other they pleased to set up; but the property of the Free Church, given to it because it was the Free Church, and to support the faith and doctrine of the Free Church, as set forth in its standards, continued to be the property of the Free Church, and could not be alienated or appropriated by those leaving it. They protested against the new movement on the ground that it was an acceptance of the "Voluntary" principle and a violation of the Constitution of the Church, as adopted at the disruption in 1843. Therefore, this feeble body, standing firmly by the ancient landmarks, with the ardor and courage of true Scotchmen, brought suit for possession of all the property which the secessionists had appropriated as their own.

Previously, however, they had made

offers of compromise that were rejected. The Scottish courts decided against their claim. This, it was thought, must end the matter, because it was not believed the clergymen would undertake the expense of an appeal to the House of Lords. But these "Wee Kirkers," as they were contemptuously styled by the United Free Kirkers, were not quitters. As it was a question of legal right to possession of the property which both parties claimed, the Wee Kirkers, conscious of their poverty, proposed that the expense of appeal to the high court of the realm should be borne by the property, much as in this country it is often agreed that the expense of obtaining a judicial construction of a will shall be borne by the estate. The suggestion was scouted.

CASE CARRIED TO HOUSE OF LORDS.

But the Wee Kirkers proceeded without faltering. They carried the case to the Lords, a proceeding involving a cost of $200,000, and they won out, being awarded the custody of the entire church property, the costs being assessed on the defendants. It was such another David and Goliath battle as has seldom been recorded. The property that was at stake has an estimated value of $50,000,000.

One may believe, as it is reported, that the tone of the manifesto read by the 1,100 clergymen to their congregations was distinctly humble as compared with the tone they had formerly held toward the Wee Kirkers. They have no standing ground in the law now. What will be done? Probably some sort of a compromise will be arranged in time, but the small body cannot be forced. It is no longer at the mercy of the other. It is, indeed, improbable that it could supply clergymen of its kind to these churches if the others should be driven out. While it is acknowledged by English newspapers that the Lords may be technically right, it is felt that the decision nevertheless strikes a blow at the cause of religious freedom. It seems absurd that the law Lords should be able to overthrow the decision of the Scottish courts in a matter of this kind, and one writer expresses a hope that the action will rouse Scotland to agitate for home rule and for the disestablishment of the House of Lords.

IN A FIRE-WORKS FACTORY.

HOW ROCKETS, FIERY PICTURES AND LURID EXPLOSIVES ARE MADE.

With its little houses scattered about beneath the trees the place looks like a summer camp. In reality it is a fireworks factory.

Within the city limits of New York, but amid the gentle bucolic surroundings of rustling leaves overhead and grass and red clover along the paths, begins every day the life of thousands of rockets that will fill the night with upshooting streams of fire, of shells that will burst into falling stars, of batteries and Roman candles that will pour forth volleys of fiery balls, of set pieces that will become pictures sketched in flame.

"So our grove here strikes you as appearing like a picnic ground, does it?"

exclaimed the superintendent in comment on a remark of a visitor. "Well, it's far from it. We have a hundred men and women working here, and the hurry orders are coming in so fast just now that you can be sure we are having no picnic.

"It is necessary for the making of fireworks to have a big inclosure and a lot of small houses, so as to prevent an explosion of powder in one from causing the whole plant to go up in smoke. Perhaps you would like to take a walk around our village."

CHINESE LABOR EMPLOYED BY THE RUSSIANS: COOLIES MOVING A BIG GUN AT NEWCHWANG.
The Russians do not hesitate to use coolie labor in Manchuria, not being troubled in any way with qualms of conscience about "slavery."

The interior of the little house in which are taken the first steps in the making of a rocket looks, upon a casual glance, like a bakeshop. Here are rows of girls standing at tables with their sleeves up and rolling pins in their hands.

At the right hand of each is a symmetrical pile of sheets of heavy brown paper and a big pot of paste. With ceaseless industry each worker is spreading sheets of the paper on the table, daubing them with paste, deftly turning them on the rolling pin, and tossing the stiff cylindrical shapes thus formed into a heap at one side. Some of the girls have large rolling pins, and some small ones, and several, who are making slender Roman candles are working with thin bars of metal.

After the paste has been allowed to dry the cylinders are ready for their charges. Those which are to become rockets are distributed among several houses, each of which is occupied by a powder-begrimed man, who works alone.

He sets the prospective rockets on end in frames holding a couple of dozen or

so, packs a foundation of clay into the bottom of each, and upon this puts a small scoop of powder. A hydraulic machine with projecting rods is now called into play. The rods slip into the paper cylinders and ram the powder tight with a pressure of seven tons.

This layer of powder is followed by another, which is also pressed down by the machine, and thus the process is continued until the cylinder is nearly filled with powder, on top of which is put another casing of clay. In other booths the rocket is fitted with its fuse, its stick, and the outer adornments that put it in readiness for the window of the fireworks dealer.

Equally simple in their making are the spherical shells which go hurtling into the heavens and flame out against the darkness into showers of stars and falling canopies of changing lights. One of their chief ingredients is waste paper.

In one of the houses is a machine for grinding the paper, and near by is a tub of it in a half liquid state. A man thrusts a dipper into this, and pours the paper through a bowlike aperture in another machine. He then moves a crank that causes a sort of rounded ram to descend into the bowl and squeeze the paper into the same shape.

These forms, which have been compressed tightly enough to handle, are passed to girls, who make globes of pairs of them by pasting them together with strips of paper. They are then left to dry. Lying on racks in the open air in sunny weather they resemble cocoanuts, and are so humble of aspect that one would never suspect that they are destined in their final moment to give forth an awe-inspiring beauty.

This beauty, in its original form, is to be found in barrels in several of the little houses in which the chemists work. Here the latter combine the various chemical ingredients into compounds, each of which when ignited will produce fire of a distinctive color. The compounds are packed into what are called pill boxes, because they are of about the same size and shape as small receptacles for pills.

Held in these, powders of various colors are stored in the shells through a hole left in the top of each, and when the mid-air explosion comes they take the form of multi-colored falling stars. To produce the snakelike and other odd effects, the compounds are arranged in forms which carry the fire in the desired directions.

This is the general principle of construction of the mines, fountains, meteors, and all the rest of the variegated forms of fireworks that make gorgeous spectacles of the night celebrations of the Fourth of July. Clever brains at the fireworks factory are constantly busy devising new effects in the form and color of the fire. An idea of this season is radium fire, an intense white light which dims the moon and causes the stars for a time to be forgotten.

A paper cone containing a charge of ordinary powder is affixed to the bottom of the shell to project it from the motor, and a fuse is put in place which fires this charge, and then, burning on, explodes the shell at a height of about 600 feet.

One of the houses in the inclosure is devoted to the making of the fuses. Here one sees men with their arms deep in vats

of powder, which has been so mixed as to bring it to a semi-liquid state. A worker puts a long coil of light cord in a vat and manipulates it there until all of it has been saturated and carries a coating of the powder. Then the cord is taken out and strung on big frames to dry. Afterward, as needed, it is cut into fuses.

Another feature of the inclosure is a smooth wooden platform that furthers the suggestion of the trees and grass that this might be a picnic ground. The platform would do very well for dancing. On it, however, are drawn in black paint three pictures of heroic size. One is of George Washington, another is of President Roosevelt, and the third is a combination of the American eagle and the Stars and Stripes.

"This is where we sketch our drawings for the set pieces," remarked the superintendent. "The three you see are used so often that we have put them down in black paint, but all others are merely chalked on the boards, and in a day or so are rubbed out and replaced by new ones.

"We have two artists constantly at work on pictures to be reproduced in fire. With the exception of the ones you see we never keep any of these set pieces in stock, but just as soon as an order comes in for a picture one of our artists makes the drawing, and it is at once sketched to scale on this floor.

"We lay a big wooden frame over the picture on the platform, and duplicate its lines in pliable bamboo, nailing the latter on the frame as we go along. On the bamboo we fasten the slow-burning fuses, which, when touched off, present the work of art in fiery outlines.

"These pictures are among the most effective of fireworks. I have often heard people marvel at them, and yet their process of manufacture is quite simple, you see. We frequently receive an order for a portrait or some other pictorial piece in the afternoon, and have it ready to ship the next morning.

"You would be surprised at the range of subjects. They vary from race horses to roses, from ships to babies. Frequently an association that wants to do honor to a leading citizen will send us a photograph from which we are expected to make a fiery likeness."

ABBATTOIR FOR THE WORLD.

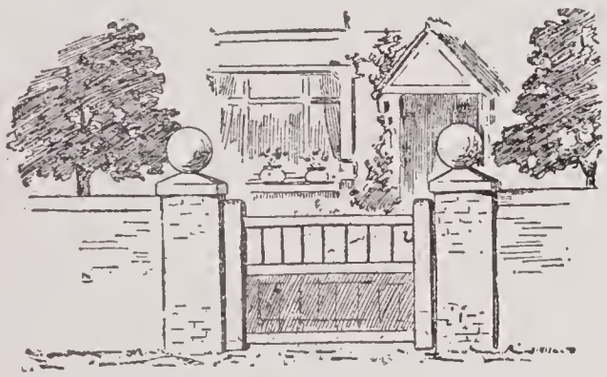
A GLANCE AT THE MEAT-FOOD CONSUMED FROM ONE SLAUGHTER HOUSE.

"The world's biggest butcher shop" is the term frequently applied to the Union Stock Yards of Chicago, and a study of a few statistics will readily demonstrate the reason. In 1903 over 300,000 carloads of live stock, valued in round figures at $300,000,000, were slaughtered within the precincts of the yards, or approximate to fifty per cent of the total receipts at all stock centres in the country.

Over $40,000,000 was distributed in wages to over 50,000 men employed in various capacities about the yards. This vast volume of business is divided among nearly 100 firms. Many of these, however, are comparatively unknown to the country at large and are controlled by

the Armour Company, Swift & Co., Nelson Morris, the Cudahys, and Schwarzschild & Sulzberger, the firms which have made "Packing Town" famous. The combined investment of the 100 firms within the yards is over $100,000,000. At this time when attention is called to this vast enterprise a little of the history of the development of Chicago's vast slaughtering business will undoubtedly be of interest to many citizens who know that this city is in the lead of all packing centres but do not know why.

Way back as far as 1848 the Chicago slaughtering industry was given an impetus by the establishing of the "Old Bull's Head" stock yards at Madison street and Ogden avenue. It was a great institution for the time, but was overshadowed in 1854 by the completion of a new yard at State and Twenty-second streets.



Antiquarians claim that balls upon the top of gate-posts originated from skulls set upon stakes before the doors of our forefathers' dwellings.

In 1860 a half dozen stock yards were established in various parts of the city and the necessity for a union yard manifested itself particularly to the railroad interests.

It was not until 1864, however, that the Union Stock Yards and Transit Company was organized with a capital stock of $1,000,000. A tenth of this sum was expended for 320 acres of "worthless marsh land" belonging to "Long" John Wentworth, and it is on this meadow that the greatest packing centre in the world is located. The area has been increased since to nearly 500 acres to meet the demands of the rapidly growing enterprise.

Within this yard are twenty-five miles of streets, forty miles of water troughs, 9,000 cattle pens, 5,000 hog and sheep pens, and the enormous buildings devoted to the killing and packing business.

The present value of the property belonging distinctly to the corporation is over $10,000,000, including the real estate, the exchange building, the National Live Stock Bank building, and the recent buildings used for the annual live stock show.

Every railroad entering the city is connected directly with the yards by the company's belt line and over four miles of platforms are used in the delivery of the product to the roads.

A synopsis of the receipts and values for 1903, as taken from the report of the secretary, may be of interest:

		Value.
Cattle	3,443,428	$154,093,403
Calves	272,718	2,727,180
Hogs	7,837,649	106,787,977
Sheep	4,589,792	18,588,657
Horses	101,103	13,522,526
Totals	16,244,690	$295,719,743

Some conception of the steady development of the stock yards industry in Chicago may be gained from the knowledge that the figures for 1903 showed a gain of about nine per cent over the previous year.

BERLIN'S WONDERFUL HORSE.

HE CAN DO ALMOST EVERYTHING BUT TALK—HOW HE WAS TAUGHT.

In an out-of-the-way part of the German capital a horse is now shown which has stirred up the scientific, military, and sporting world of the Fatherland. It should be said at the very outset that the facts in this article are not drawn from the imagination, but are based upon true observations and can be verified by Dr. Studt, Prussian Minister of Education; by the famous zoologist, Professor Moebius, director of the Prussian Natural History Museum, and by other eminent scientific and military authorities. I had occasion recently to see a performance of the animal which was given in the presence of the young Duke of Sachse-Coburg-Gotha.

Hans, the wonderful stallion, is nine years old and is the property of a Herr von Osten, a retired school teacher. The horse has never been used for riding or driving. For over four years Herr von Osten has given the animal systematic instruction such as he would give to a child. The industrious pedagogue is the owner of a tenement house in the northern part of Berlin, and there he lives. The animal is quartered in a small shed adjoining a court where he is shown.

Some years ago the neighborhood was astonished by observing the training which Herr von Osten gave his animal. They beheld him and Hans at a certain hour of the day standing in the court before a blackboard and counting machine. Herr von Osten, undismayed by ridicule (for by his method he had gained the reputation of being an old crank), instructed the stallion by showing him the balls on the machine, and influencing him to indicate a number by stamping down his right hoof. At the same time, while the horse was doing this, his instructor spoke the name of the number. Then every time Hans put down his foot correctly he would be rewarded by a carrot or a piece of sugar. All other things the intelligent animal learned by seeing certain objects and at the same time hearing their names. In this way words to him became signs for visible objects, and he used footsteps as signs for his perceptions, according to the same psychic laws as we use a language to make others understand.

After Herr von Osten had taught Hans this simple sign language, the foundation for further education was established. He put before him gold, silver, and copper coins, and taught him to indicate gold pieces by one movement of the foot, silver with two, and copper with three steps. When, for example, three coins were placed in a row, Hans stamped down his foot three times when asked the number. He is also able to distinguish coins according to signs. When asked to give the value of a one-mark piece touched by his teacher, he moves his foot once, for a two-mark piece twice, etc.

Hans is an expert in numbers, even being able to figure fractions. He answers correctly the number of 4's in 8, in 16, in 30, etc. When asked how many 3's there are in 7 he stamps down his foot twice and for the fraction once. Then, when 5 and 9 are written under

each other on the blackboard and he is asked to add the sum, he answers correctly.

Hans is also capable of distinguishing persons. He told the number of girls and officers standing in a line.

AN INCIDENT OF EQUINE SAGACITY.

This very remarkable thing happened. An officer was pointed out, and Hans was told, "That is Count Dohna." Half an hour later the same man was pointed out to him, and when asked for his name the horse picked out the letters D-o from the blackboard. Herr von Osten, however, having the name Doenhof in mind, wanted to help the animal by uttering "Do." Uninfluenced, however, Hans spelt out correctly "Dohna." In the same manner Hans was introduced to the Prince of Sachse-Coburg-Gotha, and also gave his name correctly.

The versatility of Hans in other directions is astonishing. He can distinguish between straw and felt hats, between canes and umbrellas. He knows the different colors. One beholds several colored rags fastened on a string. A cavalry officer places himself before the horse and Hans is asked to state the color of his cap. The horse answers by stamping his foot down three times—the color of the third rag, which, like the cap, is red.

Hans, the German horse, declared by scientists to have human sense.

Hans has also been taught to distinguish tones. The various tones of the musical scale are numbered, and he rec-

ognizes their position by his usual method.

Hans can tell the time on a watch and can indicate the exact hour. At the test he recognized persons from photographs. Herr von Osten placed persons in a row who had given him their photographs, then put the picture before the horse and asked him to indicate the position of the person in the line. Again Hans recognized the gentleman in civilian clothes who the day before had been introduced to him in uniform. He knows the names of the months and indicates the day of the week by putting down his foot. Sunday once. Monday twice, etc.

EXAMINATION BY A SCIENTIST.

Professor Moebius, the eminent zoologist, has this to say about Hans:

"He possesses the ability to see sharply, to distinguish mental impressions from each other, to retain them in his memory, and to utter them by his hoof language. Of course, not by himself has he learned all this, but by methodical instruction of a human intelligence, who has developed the highly intelligent senses of the species horse. For wild horses, not trained, in the same manner utilize their physical and psychic faculties as does Hans, to satisfy their desire for food.

"Herr von Osten has succeeded in training Hans by cultivating in him a desire for delicacies. This desire is aroused by questions and finger signs, according to which the stallion acts, in order to satisfy his aroused desire, for as soon as he puts his foot down he snaps for the delicacy in the hand of his master. I doubt whether the horse really takes pleasure in his studies. He follows entirely mental impressions which he receives from the surroundings and which satisfy his wants."

Hans is the second horse Herr von Osten has trained. He claims that any horse of fair intelligence can be so taught. Herr von Osten's training is done purely from a scientific standpoint, and he told me that he greatly regretted the premature publicity given to his work.

HOW BANK ROBBERY IS MADE IMPOSSIBLE.

During the last twenty-five years no attack, successful or otherwise, has been made on any bank vault in the United States in cities of over 50,000 inhabitants. Most of the bank robberies occurring today take place in towns of 2,500 to 7,500 inhabitants. In the larger cities where the treasure really is no one even attempts to rob a bank.

Why is this?

Money can protect money. That is the whole secret. The country banks depend on safes costing perhaps a few hundred dollars; a great city bank spends perhaps $150,000 for its burglar and fire proof vaults. And these vaults are proof. They are absolutely unassailable. The guarding of a bank's money has been reduced to such a science that a banker, having once taken the proper precautions, never gives the matter a further thought, though he have millions of dollars within his doors.

STEEL LINING COSTS THOUSANDS.

The fireproofing for a large vault can be constructed for from $10,000 to $15,000. It is the burglar proof steel

lining that brings the cost of vault construction up to the six figure mark.

Think of a steel door weighing twelve tons or of a hinge alone weighing one ton! When that door consists of ten inches of drill proof steel, plate lapped on plate, do you wonder that even the most daring burglar has never attempted it? Such a great door usually has some four and twenty two or three-inch steel bolts which shoot out automatically in four directions as soon as the door is closed. The entire closing of the door is absolutely water tight. The closing has actually been tested one whole night under water. This closing is of the "tongue and groove" variety and the groove is packed with packing.

This formidable door is furnished with a time lock that can be set for any number of hours and that cannot be opened until the hour for which it is set arrives. The door is furnished with perhaps three duplicate timers, so that if two should fail to work there would still be one to open the door.

ONLY OFFICIALS ALLOWED INSIDE.

Inside the great door a massive grating called the day grate gives access to the vault. To this chamber, which, with its four-inch walls of drill proof steel, is worthy of Vulcan himself, only the active officials of the bank have entrance. Here are the tellers' safes, where they keep the money for the day's business. Here are bags of gold, $5,000 in each, piled up like so many bags of buttons, each bag most securely tied and sealed. Here are packages of bills stacked up like bricks. The ones and twos in $1,000 packages; the fives in $5,000 packages; and the tens and twenties in $10,000 packages. The bills in each of these packages have been counted, tied up, and sealed by two persons in the presence of each other, so that the bank can guarantee the amounts as given on the labels without recounting.

Here, beside the tellers' safes, are compartments where the collateral received for loans to depositors is kept.

But this is only the outer division of the vault chamber; beyond is another massive grating dividing the vault into two rooms. No single official can penetrate to the inner shrine, and one of the two officials necessarily present must be a director of the bank. Here is the holy of holies, where repose the reserve funds of the bank—millions of gold and paper money. The reserve funds are kept in safes on which the locks are timed to open every morning, so that if necessary the bank tellers could have the money at a moment's notice.

CAN'T USE NITROGLYCERIN.

The two divisions of the vault form really one chamber with walls of drill proof steel. The walls are drill proof, yet, as a matter of fact, the up-to-date burglar does not work with drills. A few sticks of dynamite, some nitroglycerin in a bottle, with alcohol, putty, candles, wire, wire nippers, and an exhaust pump, are the principal items in his outfit. With these tools he often "makes an impression" on a small safe. But a single charge of dynamite heavy enough to open the joints of a big vault would wreck the whole building. Unlimited time, therefore, in which to work would be necessary to the successful wrecking of a drill proof vault

by explosives. For it would be necessary to use a long succession of small charges; to work patiently at plate after plate, and the conditions make this absolutely impossible. The reason such great pains are taken to make all joints water tight is to guard against the introduction of nitroglycerin, which has about the consistency of honey or common glycerin. Nitroglycerin is not effective unless it is inside the safe or vault.

The entire great steel room is made fire-proof by being inclosed in brick, or tile, or cement walls, between which and the steel walls is an air space four or five inches thick. Air is a nonconductor of heat, and being interposed between the brick and the steel walls prevents the latter from becoming overheated. So perfect is the protection that even when a building has been destroyed the contents of the vaults within have remained unchanged. Several such instances were noted after the Baltimore fire.

PROVIDE FOR WATCHMEN'S FAILURE.

Notwithstanding these extraordinary safeguards against fire and thieves offered by these walls of steel and fire-proof brick just described, the bank vaults are never left without human guards. All night three watchmen patrol the entire building. These men are required to set off certain signals in various parts of the building every half hour. The record of these signals is shown on an electric clock. If one watchman failed to make one signal at the proper time the record clock would disclose such failure. Besides these ordinary signals there are alarm boxes near the vault door where the watchman can ring up the police, fire department, etc.

Even should three watchmen fail in their duty—something hardly to be imagined, since it would mean ruin to the men—there is an automatic alarm set off by any contact with the inner surface of the vault. So, if one can imagine the unimaginable and suppose the impossible, that by any means a thief could get through the walls or the door of the vault, the moment he reached the inner surface a gong on the roof or in the street in front of the bank building would clang out an alarm that would be heard three blocks away.

A still further piling of Ossa on Pelion is the insurance which all the large bankers carry on their depositors' money, stocks, bonds, and other collateral.

Considering all these extraordinary safeguards which are commonly taken by a bank, is it any wonder that, with the exceptions noted, no bank vault in the large cities has been even attempted during the last twenty-five years?

LATEST EXPLORATIONS.

Major Powell-Clayton, in his recent African explorations, went to Mount Elgon, the country of the cave dwellers. He describes the discovery of an unusually interesting cave occupied by some of these people. "I was examining with a telescope," he said, "a waterfall which the Fish river made as it fell over the precipitous rocks encircling the lower slopes of Elgon, when I discovered the entrance to a cave close to the fall. My guides casually informed me that it was one of

the habitations of the cave dwellers, but they supposed it to be deserted. However, next morning, I paid it a visit and thoroughly explored three of the caves, two of which, to my astonishment, proved to be still inhabited. This kindled my interest and a day or two later I made further investigations, visiting another group of caves, all of which were occupied.

DUG BY PREHISTORIC RACE.

"Here the father of the cave settlement, although at first suspicious of my intentions, afterward became friendly and introduced me to the members of his family. He likewise conducted me all over his cave. On my inquiring as to the origin of the caves they said they were natural, and ridiculed the idea that any man could do such work; but as I could distinctly trace tool marks over the whole surface there is no doubt in my mind that these caves have been hewn out either by some prehistoric race or possibly by the remote ancestors of the present inhabitants."

In the midst of the country of the Karamoja Major Powell-Clayton found the Tepeth, a tribe living apart from the other occupants of the country, who protected themselves from the other tribe, which outnumbered them a thousand to one, by taking advantage of the superstitious fears of the stronger race. In reply to questions they said that if the Karamoja interfered with them they cast a spell which caused the latter's cattle to perish. The huts of the Tepeth villages, unlike the huts seen previously, were two-storied, the entrance to the upper story being a sort of dormer window in the thatched roof which was reached by a rude ladder formed of a tree trunk.

HOW THEY FOUGHT.

The Karamoja warriors had an interesting method of attack in battle. They would advance by a succession of short runs of about twenty paces forward, interrupted by halts in a kneeling position. When they knelt they would protect themselves by means of a narrow and long shield. These shields were of skin and wickerwork, the latter being used by the youths in practice for warding off sticks thrown by their companions. It was surprising how much of the body was protected by these light and narrow shields.

Later on in his travels he encountered a tribe known as the Turkana, which was considered to be warlike. He convinced them that he was friendly, and getting out a gramophone he quickly attracted an admiring crowd of listeners about his tent.

TAMED BY MUSIC.

It proved to be a case of "music hath charms to soothe the savage breast." Of the concert and the Turkana themselves Major Powell-Cotton said: "Band pieces did not appeal to them, but banjo duets or anything with the human voice, whistling or the imitation of animals' cries, evoked either roars of laughter or approving grunts. The Turkana were fine, tall men. The heads of families wore their hair in a matlike form, as among the Suk and Karamoja, while others had a great topknot of clay decorated with either a big pompon of ostrich feathers or single feathers stuck all over it. Nearly all the men wore little dressed-leather aprons

behind, some edged with beads, some not. Many wore knives, almost encircling the right wrist, measuring one and a half to three inches in width and guarded with leather. The iron hooked finger ring for tearing the enemy's flesh at close quarters was also common. Most had a necklet of iron wire, or in some cases a 'masher' collar formed of several rings one above the other. This held a lump of elephant fat, which as it melted trickled down the chest—a mark of opulence and fashion.

HABITS OF THE TRIBE.

"The men of the tribe wore no clothes, but their women—who were not prepossessing—wore hide skirts, those of the girls often rather prettily embroidered with beads. A few men had fine giraffe tails as tassels fastened just above the left elbow. Their spears were mostly like the Karamoja's; a few were larger and had blades less leaflike. The shields were also like those of the Karamoja, but generally larger. A few had snuff boxes of small tusks of a cow's tail, the long hair being left on the open end closed by a leather cap."

Leaving the Narash valley, Major Powell-Cotton went in a northwesterly direction and came to a range of hills, along the foot of which were many brackish pools. The whole countryside was studded with the remains of elephants, greatly to his surprise. In all his journeyings through the elephant country he never before had found two skeletons together. "I thought," he said, "that some fell disease had attacked a vast herd, but on questioning my guide, he said: 'Oh, no; this is the place where the elephants come to die. We often come here to pick up the ivory.'

CEMETERY OF ELEPHANTS.

"I had heard of places like this from the Swahili traders. One man in particular had told me that far away to the east of Lake Rudolph he had come upon one of these elephant cemeteries, and in a few days had collected more ivory than his caravan could carry; but I had always regarded these stories as fables, till here under my own eyes was the proof of their truth."

Before reaching the headwaters of the Nile, where he took boat for a more civilized clime, Major Powell-Cotton encountered the warlike Dodinga, from whom he had difficulty in escaping. He found the men to be well over six feet high. They were naked save for a lot of brass armlets and wristlets. Nearly all the men had two cuts on each cheek and on the forehead, like the Soudanese. Their women had a regular pattern scored on the body, and the head partly or wholly shaved.

POTO-LA.—RESIDENCE OF THE DALAI LAMA.

Poto-la, as shown in the above sketch, is a magnificent example of characteristic Tibetan architecture. The hill, which is flanked and capped by the Dalai Lama's grand palace, towers some 300 feet above the city. The walls of the palace are of a dark red color, long lines of stone steps lead up the face of the hill to the building proper, and the audience chamber is at the highest portion of the pile, from which is obtained a magnificent view of the fertile valley, with the distant hills and, immediately below, the gilded spires

of the sacred shrine of Jokhang and other temples set in groves of green. In the reception hall three rows of pillars, four in a row, support the roof, and a skylight is used for illumination. Sarat Chandra Das describes it as hung with rich brocade. The religious utensils were all of gold, and behind the throne were tapestries and a satin canopy. The floor was smooth and glossy, and the doors and windows were all red. The throne itself was supported by carved lions, and covered with silk scarfs. It was about four feet high, six feet long, and four feet broad. Among the State officers was the Kuchar Khanpo, with a bowl of holy water colored yellow with saffron; the censer-carrier, with a golden censer with three chains; the Solpon chenpo, with a golden teapot; and other household officials. Two gold lamps burned on either side of the throne.

NOTABLE AND CURIOUS ITEMS OF INTEREST.

TAIL OF A COMET.

The tail of a comet indicates waste of substance, for the tail which we see today is not the tail we saw yesterday, any more than the smoke of the steamer leaving Liverpool is the same smoke that we see when the steamer enters New York harbor. The tails are in the form of a hollow truncated cone with a dark or bright stripe in the centre. At every subsequent return of the periodic comets to perihelion, it is seen that the tail becomes shorter and shorter; the gases thrown off are never regathered by the nucleus, but are dissipated throughout space. The comet thus becomes smaller and less luminous, and finally ceases to be visible.

ORIGIN OF DIAMONDS.

Quite recently the startling discovery of a perfect diamond, imbedded in a meteor, has been made, and this has given rise to the well-founded opinion that diamonds are of celestial origin—are, in fact, visitors and not natives of the earth. The volcanic theory of their origin is untenable for many reasons, among which may be mentioned that diamonds cannot be formed in the presence of oxygen, and although all the necessary conditions of heat, pressure, and electrical energy are possible in volcanic action, yet these were never succeeded by sudden low temperature which scientists have shown to be equally requisite for the crystallization of carbon to form a diamond. Again, geologists have never been able to assign a place in the terrestrial strata for diamonds, which are always found in isolated places and never in the masses of carbon such as the coal measures. They have different refractive powers in their interior and exterior parts owing to the tension generated during their crystallization. The diamonds of Kimberley, South Africa, are liable to crack on coming into the air, and the diamonds of the meteorite found in Arizona have done the same thing. This singular relationship tends to show that they have been subjected to conditions of pressure and temperature unknown to any terrestrial era through which they may have passed. Moreover, they have a different law of crystallization from the carbon of terrestrial origin and formation,

ATMOSPHERE AND CLOUDS.

According to recent theories the atmosphere surrounding the earth extends several hundred miles upward instead of only 60 as was formerly thought. The real distance is estimated at 500 miles by observing the descent of meteors through space.

Clouds of feathery forms extend ten miles overhead. They are highest in summer and lowest in winter, sometimes descending to within half a mile of the earth. Though they seem to move slowly they travel really at the rate of sixty to ninety miles an hour. The thunder clouds of the summer season are sometimes seven or eight miles tall from base to summit.

The aeronaut Glaisher was carried to the height of seven miles in a balloon in 1862. This is the greatest height ever reached by man. Six miles up the rarified air would produce unconsciousness, unless oxygen were supplied artificially.

TO HIT YOUR FOE WITHOUT LETTING HIM SEE YOU.

Mr. G. Waller, an officer in the Swedish Army, has invented a new fusil. When soldiers are firing from a rifle pit they are obliged to expose their heads. To obviate this Mr. Waller has put a little mirror on the rifle, which permits the soldier to aim with the greatest accuracy and yet keep himself hidden. Experiments undertaken with this device have given good results. The mirror may be taken off and hidden in a box in the butt-end of the rifle.

THE HEAVIEST RAINFALL.

The annual rainfall on the Khasia Hills, to the northeast of Calcutta,

amounts to some 600 inches, 500 inches of which falls in seven months, during the southwest monsoon. It is undoubtedly the wettest spot on the globe. As many as 150 inches have been registered in five consecutive days, or an average of 30 inches a day. This astonishing amount is due to the abruptness of the mountains which face the Bay of Bengal, from which they are separated by 200 miles of low swamps and marshes.

LAND HEIGHTS.

The mean height of land above sea level, according to the most scientific geographers, is 2,250 feet. The mean depth of the ocean is 12,480 feet. Only two per cent of the sea (oceans in general) is included inside a depth of 500 fathoms, while seventy-seven per cent lies between 500 and 3,000 fathoms. If the land were filled into the hollows of the seas, water would roll over the earth's crust to a uniform depth of two miles.

HOT ARTESIAN WATER.

An artesian well at Boise, Idaho, spurts water with a temperature of 170 degrees F. This water is largely used to heat Boise. The water is piped from about one mile distant, losing only four or five degrees in transit.

UNDERGROUND WATER.

The earth contains an abundance of water, even in places like some of our great western plateaus, where the surface is comparatively arid. The greatest depth at which underground water can exist is estimated to be about six miles. The amount of water in the earth's crust is reckoned at nearly one-third of that contained in the oceans, so that it would cover the whole surface of the globe to a depth of from 3,000 to 3,500 feet. The waters underground flow horizontally after sinking below the unsaturated zone of the rocks, but in the sands of the Dakota formation, which supply remarkable artesian wells, the motion does not exceed one or two miles a year. The underflow toward the sea beneath the great plains may sometimes take the form of broad streams.

TO BRING DOWN SOOT.

Zinc is a peculiar metal in many respects. It volatizes easily and the oxide thus produced has a strong affinity for carbon. If one's chimney is clogged up with soot and the owner desires to get rid of it, all that is necessary is to throw a little zinc scrap into the fire. Any old zinc will do, and very little will suffice to keep the chimney clean if used about once a week. The vapor of zinc oxide seizes upon the carbon of the soot and forms a new chemical compound, part of which goes up the flue and part falls to the bottom, to be shoveled out as ashes.

SOME NOTABLE BRIDGES.

Niagara Suspension bridge, built by Roebling in 1852-55, cost $400,000; 245 feet above water; 1,268 feet long; estimated 1,200 tons.

Brooklyn bridge, New York, was commenced under the direction of J. Roebling in 1870, and completed in about thirteen years; 3,475 feet long, 135 feet high. Cost $15,000,000.

Canti-Lever bridge, 1884, over the Niagara, steel. Length, 910 feet; weight 3,000 tons. Cost, $222,000

Victoria bridge, at Montreal, over the St. Lawrence river (tubular), 9,144 feet long.

Louisville, over the Ohio river (truss), 5,218 feet long.

St. Louis, over the Mississippi river (steel), 2,045 feet long. Cost over $6,000,000.

The old London stone bridge, commenced in 1176, completed in 1209.

FOUR KINDS OF YEARS.

There are four kinds of years for the people who live on the earth.

The lunar year, the time required for moon travels around the earth twelve times. This is 354 days 8 hours 48 minutes long, and is the year of the Jews. It is 11 days shorter than the solar year. To make good this defect the Hebrews add a thirteenth month of 30 days every third year, but even then they are still three days behind solar time.

The solar year is the time in which the earth completes one journey around the sun. This is 365 days 5 hours 48 minutes 49 seconds long.

The sidereal year, the time required for the earth to travel around the sun and return to the same position with respect to the sun and a given fixed star, is 365 days 6 hours 9 minutes 9 seconds.

The anomalistic year is the period in which the earth revolves from perihelion, the nearest point to the sun, back to perihelion again. This year consists of 365 days 6 hours 13 minutes 49 seconds.

STRANGE CONSEQUENCES OF WAR.

The strange and interesting fact, founded on scientific observation, that war always brings as a corollary a great increase in the birth rate of boys, is recalled in connection with the birth of a son to the Czarina. In peace the imperial family's hopes failed. In war they were realized. It is a matter of record that following the Civil war in America the birth rate for several years was heavily in favor of boys.

GROWTH OF THE HAIR.

If the hair on your head did not fall out it would grow to the tremendous length of 39 feet in 72 years, and would be an intolerable nuisance. When you think that there are about 80,000 hairs on a woman's head it is easy to see what a mass she would have to carry if she did not cut it and it grew almost forty feet long. Placed end to end there would be 600,000 miles of hair, reaching from the earth to the moon and back, with 100,000 miles to spare.

SUPPOSITION OF CONTINUOUS GROWTH.

If a man were to keep on growing all his life at the same rate that he starts at, he would be sixty-four feet tall on his seventy-first birthday.

JUMP OF MAN-FLEA.

If a man's legs were built in proportion to those of a flea he would be able to jump 800 feet at one bound.

FISHES WORTH WEIGHT IN GOLD.

The most beautiful and costly fishes in the world come from China, and the rarest and most expensive of all is the brush-tail goldfish. Specimens of these have sold for as high as $700 each, and in Europe the prices range from $250 to $500. The brush-tail goldfish is so small that a half-crown piece will cover it, and probably there is no living thing of its size and weight that is worth so much money.

AS OTHERS HEAR US.

A well-known Oxford don was asked to speak into a phonograph and was interested in hearing the reproduction. He listened throughout, then said with scarcely concealed disgust: "Through this machine I am able to speak in a peculiarly bumptious and affected manner." The worthy man had heard himself as others hear him, that was all. It would be a good thing for many of us to study our method of speaking through the medium of a phonographic reproduction.

OUR "HURRAH" VICIOUS.

In shouting "Hurrah" we are (in these days unconsciously) repeating the victorious cry of the Cossack Tartars in pursuit of their enemies—a cognate word to the "Maro" of our Indian cavalry as they encourage each other to strike. Both words simply mean "Kill!" We should now adopt for this purpose the popular and victorious cry of "Banzai!" which means simply "success," or "good fortune." Not only will this be a compliment to the Japanese, but it will supply a more suitable cry for civil occasions.

VALUE OF SOOT.

Chimney soot is one of the richest fertilizers known. That from coal is very rich in ammonia. When coal is burned, ammonia is set free, and during the various changes which take place during the process sulphite and carbonate of ammonia are both formed.

Soot is a highly compound substance, containing in its composition not only ammonia but lime, sulphuric acid, nitric acid, acetic acid, chlorine and iron, nearly all of which are valuable, directly or indirectly. The value of soot is well known in England where it sells for about £10 a ton, or about $48. It is often thrown away as worthless by those who do not know its value, but careful farmers should save every ounce for use. Sprinkled around some kinds of plants, it often prevents attacks from insects, and the rains then carry it down into the earth, where it does duty as a fertilizer. Soot from coal has been once thought to be a very worthless substance, but experience and science have taught us to know better.

ARE YOU A DEGENERATE?

Professor Frederick Starr, head of the anthropological department of the University of Chicago, has given his class in elementary anthropology a list of the marks of degeneracy. Here they are:

Red hair, but not for the Irish.

Blond hair in dark races—all right for Swedes.

Bat ears.

Ears with small lobes.

Parting hair on right side or in the middle.

Gray hair before age of forty-five.

Cross eyes.

Left-handedness.

Men wearing much jewelry.

Tattooing.

Snub nose.

Cowlicks in hair.

Baldness.

Receding chin.

Protruding lips.

Teeth set wide apart.

"A person may have twelve of these marks of the degenerate," said Professor Starr, "and be all right. If he has sixteen of them, pity him."

"You needn't look at me so closely,"

he remarked as the students gazed at him after the "teeth wide apart" rule. "I know I have many of the marks.

"These marks are hereditary, and by them you can tell the tendency of a person toward degeneracy."

Speaking of bat ears he said: "It is strange that the only two bat-eared students in this class are sitting together."

Then he added: "I know a young man in one of my classes who wears four rings on his fingers. Within ten years that young man will go to ruin."

SECRET INKS.

There are several ways in which two persons can correspond with each other unknown to even the people before whose eyes the very letter is held. Ovid taught young women that when writing to their lovers they should use new milk as ink. This when dried is invisible, but by scattering coal dust or soot upon the paper the writing becomes legible. Ansonius adopted this method when writing to Paulinus.

Diluted sulphuric acid, lemon juice, solutions of nitrate and chloride of cobalt, or of chloride of copper write colorless, but on being heated the characters written with the two first become black or brown, and the latter green. When the paper becomes cool the writing disappears and leaves the paper blank again. Saltpetre dissolved in water and equal parts of sulphate of copper and sal ammoniac dissolved in water are two good invisible inks. On being heated the writing turns yellow.

There are also some inks which are invisible when dry, but visible when moistened with another liquid. Thus a solution of muriate of antimony washed with tincture of galls becomes yellow; green vitriol ink washed with the same solution turns black; nitrate of cobalt washed with oxalic acid turns blue; arseniate of potash with nitrate of copper, green; solution of gold with muriate of tin, purple.

VAST UNDERGROUND WALL IN TEXAS.

Near Rockwall is one of the most curious formations in Texas. This town and county were named after it, and many contend that in spite of the opinion of scientists to the contrary the formation is the product of the toil of a prehistoric race of people.

The rock wall, as it is known, extends along three sides of the town, but generally at some distance from it, although to the south it is to be found within 200 or 300 yards of the corporation line.

No one seems to know just how long it is, but traces of it have been discovered across the river in Dallas county.

Geologists say that the wall owes its origin to a volcanic upheaval. It is composed of stones which are three inches thick and from six to eighteen inches in length. They are piled on top of one another, just like brick, and with the same regularity.

PLOWS TURN UP BRICKS.

All of it is under ground. At some places it comes to within ten feet of the surface of the earth. In others one will have to dig down to twice that depth before its top is touched. In the localities where it is nearest the surface plowshares have turned over many of the stones and some of the fields are plentifully besprinkled with them.

Wells have been dug down by the side of the wall for a distance of fully fifty feet, but it extends beyond that depth.

The stones are of a light yellow color and evidently have mica in them. There are some streaks, too, which closely resemble white marble. The substance is very hard and when exposed to the elements does not deteriorate. This is attested by pieces which have been left exposed for more than a generation.

UNLIKE ROAD FOUND NEAR BY.

Another curious thing about it is that there is no other stone in the county which is just like it. Rockwall county has some fine building stone, but it is an entirely different kind. It resembles more nearly than anything else the bricks which are manufactured from the clay found in this section.

Many believe that this wall was built by prehistoric men as a fortification for a settlement which once stood on this very spot. Asked to explain why it is that the wall is now under ground, they call attention to the belief of geologists that once the Red river found its way to the sea down through this valley, and that it was miles in width. This black dirt, the theorists contend, is a mixture of alluvial deposits and clay, and these deposits, they say, covered up the walls.

COLLISION OF A LOCOMOTIVE AND A BOAT.

A branch of the Philadelphia, Baltimore and Washington division of the Pennsylvania Railroad passes through Laurel, Del., on an embankment crossing a navigable river at that place. The railroad bridge contains a draw which is swung open when vessels are passing up or down the river at this point. A passenger train happened along during one of the times the draw is open, and the engineer misunderstood the signal which shows when the track is clear. As a result the locomotive reached the end of the bridge before the engineer noticed the danger. He reversed his lever and applied the air brakes, but too late to prevent the ponderous machine from plunging into the river. Such was its momentum that it continued to move forward as it fell, and ran head on into the schooner "Golden Gate," which was coming through the draw. The front part of the engine struck the vessel's forward deck and partly crushed it in, the pilot extending down to the schooner's keel. It was a regular collision between motors for land and water transportation.

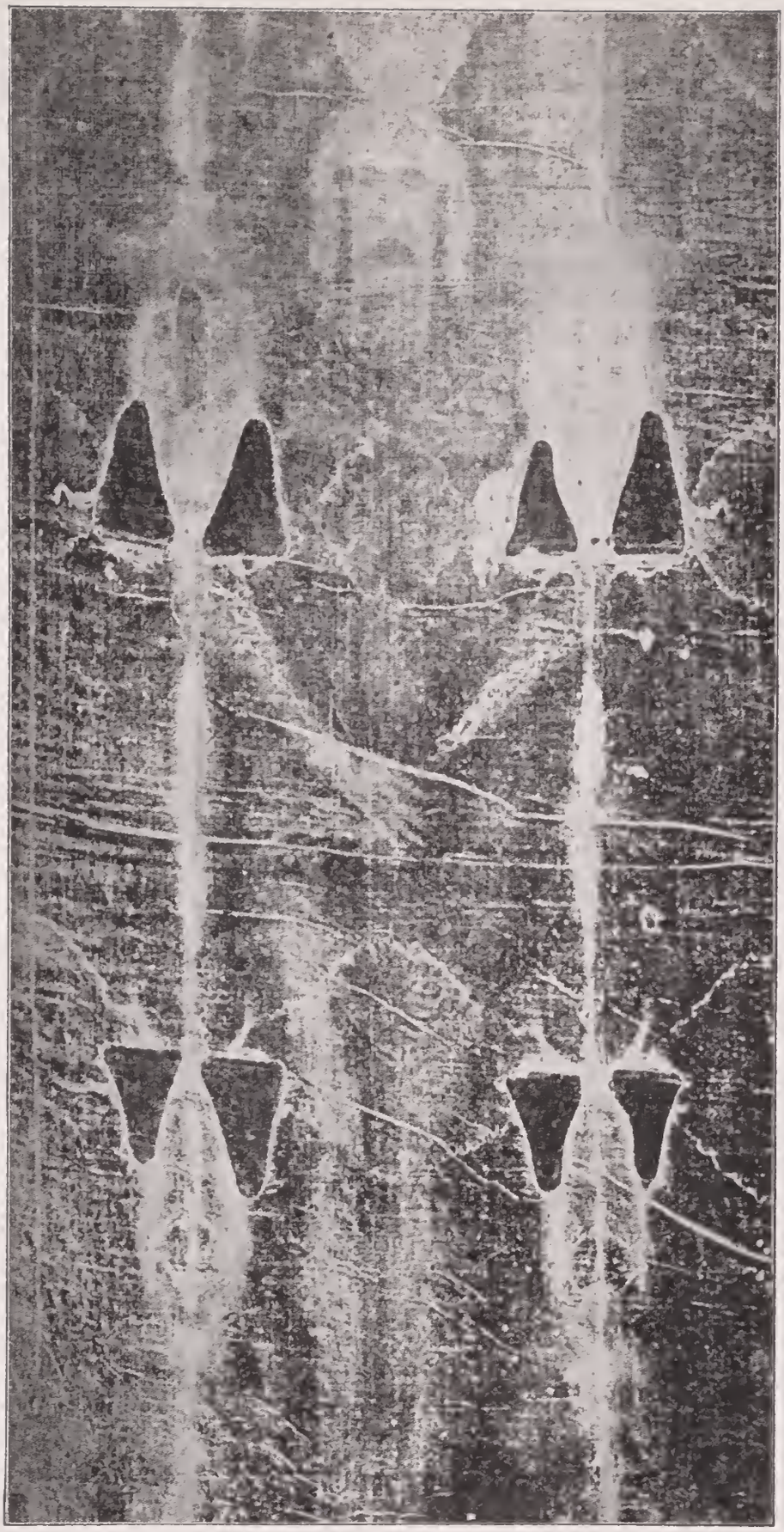
SAYINGS OF JESUS NOT IN THE BIBLE.

The "new sayings of Jesus" form the subject of a paper in the Church Quarterly Review. A few of these sayings noted there may be given here. From long known Church Fathers:

"Show yourselves tried money-changers"; "He that wonders shall reign, and he that reigns shall rest"; "In whatsoever I shall find you, in that I shall also judge you"; "He who is near me is near the fire; he who is far from me is far from the Kingdom"; "Never be joyful except when ye shall look on your brother in love."

From sayings more recently compiled by Resch, of which he regards seventy-four as authentic:

"The weak shall be saved by the strong"; "Where one man is, there, too,



THE SHROUD OF CHRIST.

The holy shroud has been preserved for centuries in the Chapel Royal of the Cathedral at Turin, and is believed to be the actual cerement in which the body of Jesus Christ was wrapped after the crucifixion, by Joseph of Arimathea. Recently, in connection with an exposition of sacred art in Turin, the holy shroud was shown to the populace, and permission given to Signor Secondo Pia, a lawyer, to photograph the relic. On developing the negative he was surprised to find what had not before been suspected, namely, that the shroud revealed distinct impressions of a face and figure. The full figure occupies the centre of the photograph. The head begins about half an inch from the top. Near the centre the arms meet, and the hands can be seen crossed. The legs bend slightly inwards, and continue to the bottom of the print, the feet pointing downwards in the position they are usually depicted on the cross.

am I"; "Thou hast seen thy brother, thou hast seen thy Lord"; "Whatsoever thou wouldest not have done to thyself, do thou not to another"; "There shall be schisms and heresies."

From Mohammedan sources:

Jesus, asked whereby they might enter Paradise, said: "Speak not at all." They said: "We cannot do this." He said: "Then only say what is good." Of charity: "If a man send away a beggar from his house, the angels will not visit his house for seven nights." Of recognition of good, where others would see only evil: "Jesus one day walked with the Apostles, and they passed the carcase of a dog. The Apostles said: 'How foul is the smell of this dog!' But Jesus said: 'How white are its teeth!' "

From the papyri just discovered in Egypt:

Jesus saith, wherever there are two, they are not without God, and wherever there is one alone, say that I am with him. Raise the stone, and there thou shalt find Me: cleanse the wood and there am I.

Jesus saith [Ye ask who are those] who draw us [to the Kingdom, if] this Kingdom is in heaven? The fowls of the air and all beasts that are under the earth [or upon the earth and] the fishes of the sea, these are they which draw you, and the Kingdom [of Heaven] is within you, and [whoever] shall know himself shall find it. [Strive, therefore] to know yourselves and ye shall be aware that ye are the sons of the [Almighty] Father.

The reviewer ends by suggesting the alternatives: These Egyptian papyri represent, either a collection made in the lifetime of the Apostles—a gospel in the making; or a second century collection, freely expanded and augmented from other sources.

PRIESTESS IS A 4,000-YEAR-OLD HOODOO.

There is in London today no living man or woman who interests Londoners half as much as an Egyptian High Priestess who died nearly 4,000 years ago. She is, of course, now a mummy and known by the officials of the British Museum as Exhibit 22,452. The history of this mummy from the time of its discovery until it was bought by the museum is one of death and disaster, and after having been quiet for a long time its spell seems to have been at work again.

The gentleman who bought it from its Arab finder in 1864 lost his fortune within a few weeks, and shortly afterward died. Two of his servants, who had handled the sarcophagus, died within twelve months. A third has lost his arm, owing to a gunshot wound.

On being transferred to London the case brought unmeasured misfortune to its new owner. Then came a startling development which suggested a connection between these disasters and the mummy case.

A photographer who attempted to make a picture of it got a negative, not of the cast of a face which is on the box, but of a living Egyptian woman, whose features wore an aspect of horrid malignity. Shortly afterward that photographer died.

The case was then transferred to the British Museum. The carrier who removed it thither died within a week, and one of the men who helped to set it in its place broke his leg next day.

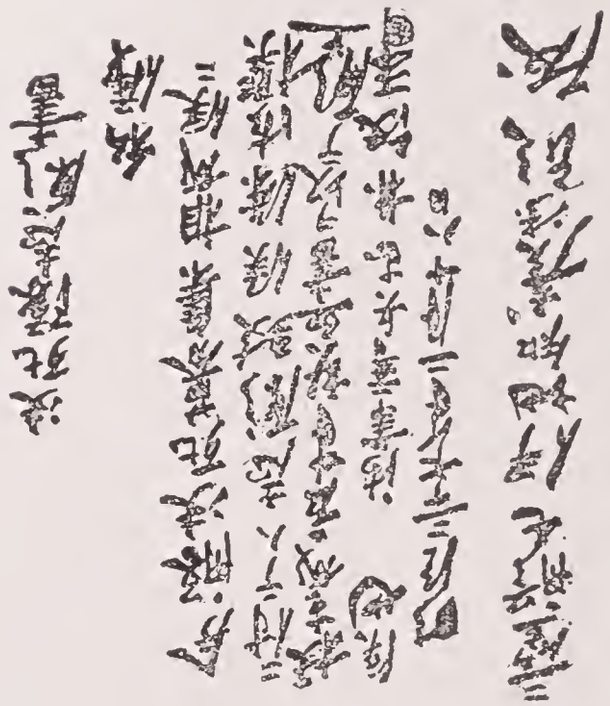
Such is the record history of the coffin cover up to a few weeks since.

A gentleman interested in Egyptology desired a photograph of the mummy case, and a few days ago commissioned Mr. Mansell, a well known photographer, to take one. As the case stands in an awkward angle, Mr. Mansell's son and his photographer visited the museum together to confer as to the best means of performing the work.

When returning home in the train Mr. Mansell, Jr., smashed his thumb so badly that he was not able to use his right hand for some time. The photographer got home safely, but only to find that one of his children had fallen through a glass frame and sustained dangerous injuries.

JAPANESE PETITION IN BLOOD.

The accompanying illustration is a facsimile of a Japanese sailor's application, written in blood, for enrollment in the corps of men resolved to fight till death. Admiral Togo, commander-in-chief of the combined Japanese squadrons, in his reports regarding the first blockade expedition, stated that in enforcing his decision to block the mouth of Port Arthur he proposed to raise Kesshitai (a corps of men resolved to fight till death), and immediately obtained nearly 2,000 applicants, of whom some sent in applications written or signed with their own blood. It is now ascertained that the man who wrote the petition with blood was the second-class warrant-officer Monpei Hayashi, belonging to the battleship Mikasa, and the other who made the blood signature was a first-class bluejacket named Suyekichi Inouye. The former bit his finger, and, making ink of the blood, which he collected in a dish, wrote the application. The Emperor has been pleased to keep the blood-autograph as reproduced above. The application, being translated, runs as follows: February 18, 1904.—Commander Hikojiro Ijichi, H. I. M. S. Mikasa.—Sir,—I being desirous of participating in the volunteer corps now being raised entreat you to select me, hereby sending in application written



with my own blood.—Monpei Hayashi. (Seal.)"

WHAT TIME IS IT?

What time is it? By what system are the clocks here and elsewhere regulated? Chicago and other points in the United States east of the Rocky Mountains get their time every day from the government observatory at Washington. The territory west of the Rockies is served the same way by the observatory at Mare Island navy yard near San Francisco. These signals are sent out when it is noon at Washington and, three hours later, when it is noon at San Francisco. Chi-

cago gets its time at eleven o'clock here, when it is noon at Washington. The signal begins at five minutes before the hour. Then the sounders in the telegraph offices connected with Washington begin to tick off the seconds, with breaks of five seconds at the end of each minute and a break of ten seconds before the end of the fifth and final minute, and then comes the noon signal.

Time thus sent out is very accurate. The transmitting clock that gives the signals is corrected shortly before noon every day from the mean of three standard clocks that are rated with star sights, with a meridian transit instrument. The noon signal is seldom in error more than two-tenths of a second, although, according to the government bulletin, a tenth more may be added by the relays in use on long telegraph lines. Electric transmission over a continuous wire is practically instantaneous. The time signal has been sent from Washington to the Lick Observatory, California, in 5-100 of a second; to the national observatory in the City of Mexico in 1.19 seconds; to Greenwich, England, in 1.33 seconds; to Sydney, Australia, in 3.5 seconds and Wellington, New Zealand, in 4 seconds.

Previous to about 1883 it had been customary for railroads to use throughout large sections of their territory the local time of one of the principal cities through which they passed. Great confusion followed, as many as five different kinds of time having been used in a single town. In 1882 the prime meridian conference met in Washington and recommended the use of Greenwich, England, civil time as an international standard. This standard is generally used throughout the world now. The United States and Canada selected a series of standard meridians differing in longitude from Greenwich by multiples of 15 degrees, or one hour each. The new standard took effect throughout the continent Nov. 18, 1883.

A RAILROAD COSTING $300,000 PER MILE.

Official announcement has been made that on June 19 the entry of the Gould system into Pittsburg will become an accomplished fact by the operation of the first regular train into that city from the West over the Wabash road. The railroad and financial worlds have been somewhat staggered at the prodigal expenditure of $75,000,000, estimated by the Goulds with a view of reaching the country's richest tonnage storehouse. The apparent disregard of expense is illustrated by the construction of twenty miles of road between Mingo Junction and Jewett, which is the most costly and in many respects the most remarkable stretch of railroad in the world.

In order to get an air line and a low grade road through the mountains, and thereby reduce the cost of transportation below that necessitated on the Pennsylvania, about $6,000,000 was used in building this twenty miles of road. Between the points named the road literally springs from hill to hill by means of enormous fills, some of which are 100 or more feet deep. In the twenty miles there are eight tunnels, five concrete arch culverts, each of fifty-foot span, and fifty large fills.

One fill 3,500 feet long required more than 1,000,000 cubic yards of earth, and a total of 150,000 barrels of cement was used in concrete arches and piers. The

maximum grade is only thirty-five feet to the mile, and there is not a curve over three degrees. So nearly straight has the road been made by disregarding every obstacle nature has opposed that it is possible to stand on the west side of the first Ohio tunnel and look through it across the trestles and over the bridge and through the tunnel in the West Virginia hill. The longest tunnel is the Hanna, 1,500 feet in length, and the shortest the Oliver, 339 feet.

In procuring this expensive air line a number of country roads were abandoned and new and costly ones constructed in their stead by the railroad company, and the courses of two mountain streams were changed so that their swollen torrents might not be a menace in floodtime. Not a single mile of the road is without its fill or cut, and of the former there are twenty-six, ranging from 200 feet long to three-quarters of a mile, and from twenty to one hundred feet deep. Across the farms in the valley some remarkable viaducts had to be built, one of them seventy feet high and 700 feet long. An idea of the heavy and substantial construction required is gathered from a concrete arch at the foot of Chapel Hill. It is a fifty-foot span with a "barrel" 180 feet long, the entire culvert containing 17,000 cubic yards of concrete and 20,000 barrels of cement, the largest single mass of concrete in the form of an arch in the world and costing $135,000.

When it is remembered that there are few examples of mountain construction which have cost as high as $100,000 a mile and that the average cost is probably nearer $60,000, while ordinary railroad construction does not average half the latter figure, there is a realization of the dogged determination which has marked the Goulds' advance to tide water.

THE PAN-AMERICAN RAILROAD.

The Pan-American railroad project contemplates continuous rail communication between New York and Buenos Ayres, a distance of 10,471 miles. The plan was first conceived by an American consul, Mr. Helper, forty years ago. It remained in the visionary stage until 1890, when the first Pan-American conference met in Washington.

The result of the great interest which this conference took in the project was the appropriation of funds by this country and other American republics for preliminary surveys. These surveys were finished in 1895. It was found that about half the required distance of 10,471 miles was already covered by railroads. With the lines either built or in course of construction there was a through communication from New York to the northern boundary of Guatemala. There was already built in Central and South America 1,417 miles, leaving 5,285 miles to be constructed.

Since the survey was made about 500 miles of road have been built in different parts of the southern continent as part of the Pan-American system, and the gaps between the railroads of the several countries are being gradually spanned. Within the last few months Chile has awarded contracts to English and American firms for tunneling the Andes. This will close the gap between that country and Argentina and bring Santiago into all rail communication with Buenos Ayres. Bolivia is pushing a railroad south along the route of the Pan-American survey to con-

nect with the Argentine system. Peru has passed a law establishing a permanent railroad guarantee fund out of the tobacco tax, and is engaged in active surveys for railway routes.

The time is coming when the American can go by rail from any city in his country to Buenos Ayres. Thence by steamer he can traverse the limitless waterways of the southern continent; over to Rio de la Plata and the Parana to the Amazon; through its myriad tributaries into Bolivia, Peru and Ecuador; then to Colombia and Venezuela through the deep "primeval hush" of rivers which lead through savannas and boundless forests to the Orinoco.

THE STEEPEST RAILWAY IN THE WORLD.

When the Jungfrau railway is completed it will unquestionably be the steepest railway in the world, for its grade is within 2 per cent of 45 degrees.

The Jungfrau, one of the most beautiful mountains in Europe, is one of the chief peaks of the Bernese Alps, and rises far above the limits of perpetual snow. For many years all efforts to render this virgin mountain more accessible proved unavailing, until the late Guyer-Zeller of Zurich solved the problem that had puzzled so many engineers. In 1894 he obtained a concession extending over eighty years from the Swiss federal council for what is unquestionably one of the most stupendous engineering feats ever attempted.

The difficulty of the project was increased by the fact that the Eiger and the Moenich had to be pierced before the Jungfrau could be entered in order to obtain the required grade. But in August, 1896, all preliminary obstacles had been surmounted, the line of railway had been decided upon and rail laying had been begun. And in September, 1898, the first section was opened.

The starting point of the railway is at Sheidegg, on top of the Wengernalp, which may be conveniently reached by rail from Interlaken. From here an electric car takes you to the Mer de Glace station, which has just been completed, and is the present terminus of the road, 10,720 feet above sea level. The trolley line runs first on open ground, gradually ascending on the slopes of the great snow-capped Figer.

When the mountain side is reached the line plunges into the rock at a grade of 25 per cent. Thus far only four miles of the six-mile tunnel have been completed, the length of the entire road, as projected, being eight miles. The work of tunneling is slow, owing to the tenacious character of the calcareous rock. At the present rate of progress—two yards a day—it will be several years before the remainder of the task will be accomplished. Three hundred Italians delve in the hearts of these mountains all the year round, being cut off from the world during the winter months—exiles in the snow.

FRENCH MONUMENT AT WATERLOO.

The monument, from a design by the French sculptor, Gerome, is of a most striking character. It rests on a stone pedestal, and takes the form of a gigantic eagle wounded to death. The site selected for the monument is near the Caillou farm, on the spot where the last square

of the Old Guard under Cambronne was annihilated.

M. E. Detaille, the well-known French painter and president of the Sabretache Society, who took a leading part in the ceremony of unveiling, which was most imposing, made a speech in which he paid a tribute to the bravery displayed by the armies of the First Empire. After formally handing over the monument to the gratulated the Sabretache Society, the promoters of the monument, on their work. "We know," he said, "that it is not a monument of victory that we are setting up. It is a cenotaph to the noble vanquished of Waterloo. Side by side with the Belgian, British, Hanoverian, and Prussian monuments, we desired to see a French memorial also in this burial place of glory." M. Gerard, the French

All that was left of a Russian convoy caught by Japanese shell-fire.

care of the Belgian people, he continued: "Although time has healed old sores, and although our valiant adversaries have since been our brothers in arms, the greatness of the event which we are commemorating has not diminished. Our feelings remain the same, and we may give way to them with less fear of offending susceptibilities, but with the same sincerity as our fathers."

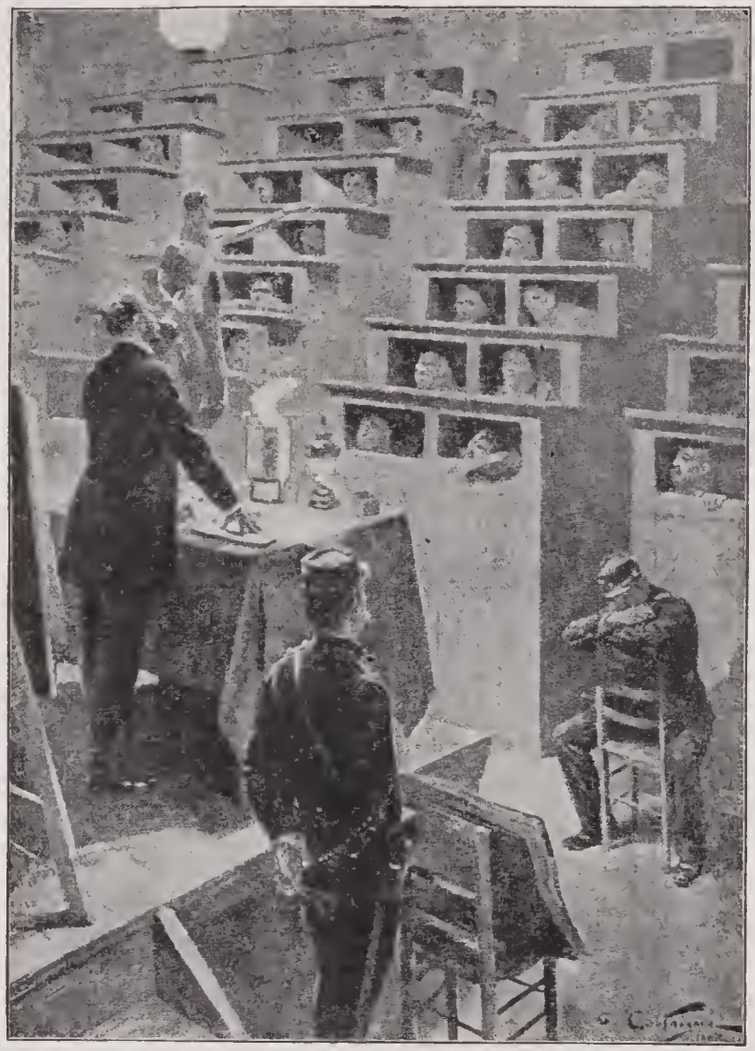
M. Henry Houssaye, of the French Academy, in an eloquent speech, con- minister in Brussels, said he was there as the representative of the French government, who desired to associate itself with those present in the pious ceremony for which they had assembled.

Lieutenant-General Bruylant, commandant of the Belgian Military School, said the Titanic combat of Waterloo was no longer looked upon by the world as anything else but the highest expression of bravery, military virtue, and patriotic exaltation. During the ceremony a selec-

tion of military airs of the time of Waterloo and Beethoven's Funeral March were played by a band.

STRANGE PLACE FOR A LECTURER.

There is in Paris a "Society for Lecturing in Prisons," which frequently sends lecturers to address the prisoners, the evils of drunkenness being a favorite topic. Such a lecture forms the subject of our artist's drawing. The lectures are given in an immense hall, on one side of which, reaching almost to the roof, are what look like steps, but on closer inspection prove to be rows of boxes with openings about four inches high, through which can be seen the heads of the audience. In this strange manner the prisoners are enabled to see the lecturer, but prevented from holding any communication with one another. Mutual recognition on release is thus also rendered impossible. These lectures against drunkenness are believed to have some influence on the diminution of crime, which has lately been marked in France, and in future they are to be given more frequently and in a larger number of prisons.



A peculiar place for temperance lectures.

THE VATICAN.

The Pope has his home in the Palace of the Vatican at Rome. This stupendous building is 1,000 feet in breadth and 1,200

in length. It is made up of many parts erected at different intervals by different architects in the prevailing style of architecture of the time.

The galleries of the Vatican are noted as containing the works of the greatest masters. In Raphael's galleries all Bible history is painted upon the arched ceilings. In the Camere di Raffaello are frescoes and paintings of the most famous artists and painters. The Vatican library contains most sacred literary relics of the Church. There is a room of manuscripts written on Egyptian papyrus. The galleries of Belvidere contain a vast array of the greatest and most ancient works of sculptors, including priceless antiquities from Bible lands.

PILGRIMAGE TO LOURDES.

The pilgrimage is held for three days every year in the week immediately following the feast of the Assumption. During the period of 1903, 950 patients were carried to the grotto where the cures are said to be effected, and 9,000 masses were said. On the closing day of the pilgrimage a procession of over 2,000 priests marked the end of the ceremonies, although individual pilgrimages take place at all times of the year.

Lourdes is a small town in the department of the Hautes-Pyrenees, on the Gave de Pau, near Tarbes. The town contains an ancient castle, and the basilica and the subterranean church of the Rosary are noteworthy, but interest centres in the grotto in which the Virgin is said to have appeared to a peasant girl, Bernadette Soubirons, in 1858, and disclosed to her the miraculous properties of the spring which the pilgrims visit. The belief in the healing quality of the spring is so widespread and so firmly held that a short time ago a well-known Roman Catholic peer in England visited the grotto with his invalid son and heir in the hope that a cure might be effected. The fact that the pilgrimage was fruitless in this as in other cases appears

to have done little to disturb the faith of the pious believers.

In the records of Lourdes are the personal testimony of many thousands of miraculous cures.

RUSSIA'S RICH SEAL AND OTTER ROOKERIES.

Among the most jealously guarded treasures of the imperial Russian crown are the great seal and sea otter rookeries on the islands in the Okhotsk sea and off the coast of Kamchatka.

In 1854 and 1855, in the midst of the Crimean war, when the Russian warships had unavoidably been withdrawn from the duty of guarding these valuable rookeries, a fleet of enterprising vessels, mostly American whalers, exploited them, many of them obtaining valuable cargoes of furs, one vessel alone, a small bark hailing from New London, Conn., securing no fewer than 55,000 fur sealskins, all of which brought an unusually high price in the London market on account of the war then prevailing, which had cut off the regular Russian supply.

The rookeries were for the time being practically destroyed, and it was years before the Russian government was enabled to kill any of the fur-bearing animals that used to abound on the islands. By careful management, however, the rookeries were gradually restored, and by 1875 they had so far recovered that the authorities were enabled to begin killing in a small way.

From this time onward the seal herd showed a steady and healthy growth, although on account of the unparalleled boldness of the seal poachers who fitted out in Japan and sailed under various flags —American, British, Dutch, German, Swedish, etc.—the Russian government was obliged to maintain the strictest vigilance and to keep a fleet of from four to eight war vessels constantly on guard about the islands during the breeding season.

The best of the otter skins have never come into the market; they have always been exacted and taken for the use of the Russian imperial family, and are consequently without price.

For years the Japanese pelagic sealers have cast longing eyes at the rich treasures on the Russian islands, and have had to content themselves with such meager pickings as could be gleaned outside of a thirty-mile limit off the islands.

ADVENTUROUS SEALERS.

Occasionally a few of the bolder spirits would venture inside of the thirty-mile line which had been arbitrarily drawn about the islands by the Russian government, but nearly always with disastrous results, for no sooner did their schooner approach anywhere near the rookeries than perhaps around the nearest point of land a column of smoke would appear, and next a sixteen-knot cruiser at full speed, a blank shot, next a shell or two, and a few days after the vessel would join a fleet of others that had gone before at Petropaulovski, while the unfortunate crew would be on board a steamer bound for Vladivostok, and it would be many years before they returned to their friends in Japan, while those who did return would always have a tale of horror to tell about the treatment they had received.

More than 200 Japanese were employed in raids during the war, and the value of the furs and fish they secured amounted to

over $7,500,000, while it is impossible to calculate the damage that was done to the Russian rookeries.

The sea-otter rookeries are without exception the richest and heretofore the most closely-guarded preserves in the world. It is estimated that there are at least 6,000 to 8,000 sea-otters there, and it is almost certain that the Japanese schooners obtained fully three-fourths of them, while they also secured from 80,000 to 100,000 fur seals from the various breeding places.

For the first time in fifty years the priceless furs hitherto selected and kept for the imperial family, the crown sables and crown sea-otter skins, came into the market.

GREATEST INDIVIDUAL LAND OWNER IN THE WORLD.

The wealthiest man in Mexico and one of the wealthiest on the American continent is General Luis Terrazas, governor of the state of Chihuahua, which borders on the western and southwestern part of Texas.

The wealth of General Terrazas is conservatively estimated at $150,000,000 in gold, but it may be many millions in excess of that amount.

General Terrazas is seventy-five years old, but he is still full of mental and physical vigor. He is probably the largest individual land owner in the world. He owns in fee simple approximately 20,000,000 acres of land, which is divided into fifteen haciendas or ranches. No one, not even the General himself, knows the number of cattle he owns, but it is roughly estimated that his herds approximate 1,000,000 head, of which about 200,000 are cows. He also owns several hundred thousand head of horses and mules.

An army of more than 10,000 men are kept constantly employed on these ranches, and towns of several thousand population are situated on the lands. The ranches are well fenced, and 1,000 boundary or "fence-line" riders are kept constantly employed.

The land and livestock holdings of General Tarrazas are a comparatively small part of his wealth. He owns more than 5,000 residences in the city of Chihuahua, from which he derives an enormous annual rental. He owns a controling interest in all of the banks and other financial institutions of the state of Chihuahua, and has many million dollars invested in manufacturing concerns in that state.

GREATEST INDIVIDUAL LAND OWNER IN THE UNITED STATES.

W. C. Greene, the multi-millionaire copper king, has bought the noted San Rafael de la Zanja ranch, in southeastern Arizona, paying $1,200,000 for its 300,000 acres and the cattle upon them. This purchase establishes him as the greatest land owner of the North American continent, for hitherto, by the purchase of land grants, he owned about 200,000 acres eastward from his latest acquisition, as well as fully 1,000,000 acres in the northern part of the Mexican State of Sonora, secured in the shape of Spanish land grants or through direct deed from the Mexican government.

Within his Mexican domain is included the Cananea range of mountains, wherein lie the great copper mines that bear his name and whence have come his riches. On the north these holdings join his possessions within the United States, the

international line running for fifty miles or more across the Greene cattle range. All the upper San Pedro valley is his, and his are the ranges all around the towering Huachuca mountains. By his latest purchase this princely domain has been extended westward beyond the border town of Nogales.

All this is one grand cattle range where barbed wire fencing is bought by the trainload and where the cowboys employed could form a regiment of Rough Riders. It is held as the property of the Greene Cattle Company, of which Greene has about all the stock. And it embraces a little ranch on the San Pedro, where the same "Bill" Greene plowed and dug, an unsuccessful farmer, not ten years ago. An old business associate, B. A. Packhard, has been placed in charge and under his direction thousands of steers are already being driven to the alfalfa fields of the Salt river valley, around Phœnix, to be fattened for market. It is expected that Greene will next invade the field of the packer, that he may the better dispose of his enormous beef crop.

The San Rafael ranch, just acquired, is an old Spanish land grant, bought twenty-one years ago, and since held by Senator Don Cameron, of Pennsylvania, Colin and Brewster Cameron, W. C. Whitney of New York, and a couple of St. Louis capitalists. The Camerons' interest has been the largest, and in their name the sale to Greene was made.

RICHEST GIRL IN THE WORLD.

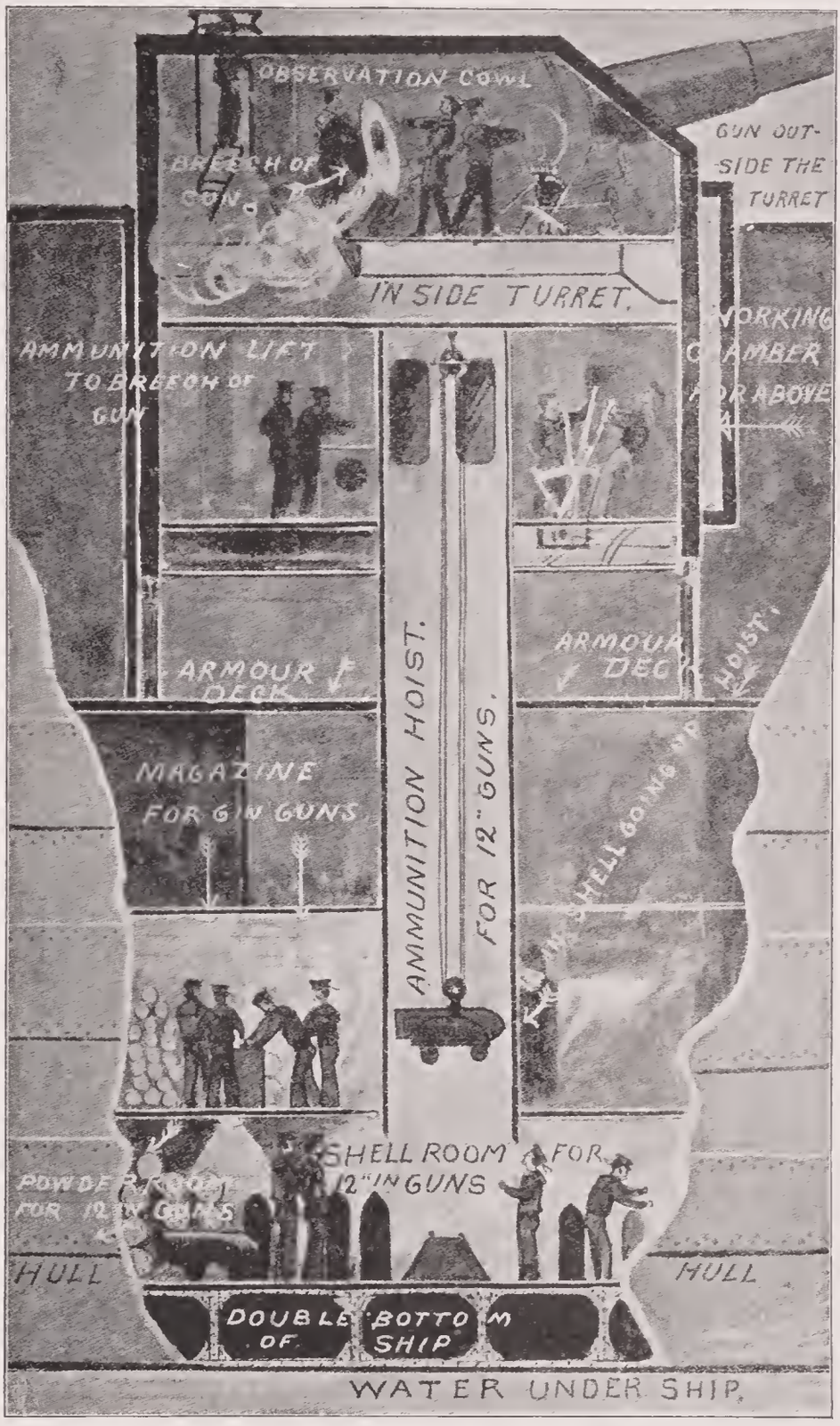
Miss Krupp, who on the death of her father became chief proprietor of the world-famed Krupp works at Essen, in Germany, is the richest girl in the world. A great deal of the artillery of Russia and Japan, France, Germany and Italy was manufactured at the Krupp works; and during the South African war England had to apply to the Krupp works to supply urgently needed weapons Practically every gun on every Russian and Japanese warship has been constructed in the Krupp works and similarly every gun mounted on every German warship, every Austrian warship and every Italian warship bears the Krupp trade-mark. Sweden and Norway, Denmark, Holland, Belgium, Spain, Portugal, Greece, Turkey, Switzerland and all the South American countries are equally dependent on the Krupp works for their naval and military armaments. Miss Krupp is a charming German girl who wields her power with discretion and generosity. The city of Essen, with its 100,000 inhabitants, is practically her private property, so that she possesses almost despotic power over her 25,000 employes and their families.

GREATEST BATTLES OF MODERN TIMES.

At the battle of Gravelotte, Aug. 18, 1870, the bloodiest in the Franco-Prussian war, the Germans lost 4,449 killed, 15,189 wounded, and 939 missing; a total of 20,577 out of 146,000 troops engaged. At Gettysburg the Union loss was greater, with half the number engaged.

During the six months following May 4, 1864, the Union army sustained greater losses than the German army did during the whole Franco-Prussian war. The German losses in that war were 28,277 killed, 85,482 wounded, and 14,138 missing, a total loss of 127,897.

Since the introduction of gunpowder



An Ammunition Hoist.

On the modern battleship one of the most ingenious of the contrivances is the ammunition hoist which brings up the shells from the magazine to the guns. The hollow masts are utilized for the purpose of hoists for the fighting-tops.

the bloodiest battle in history was the Borodino, Sept. 12, 1812. There the Russian losses were 30,000, according to the Encyclopædia Britannica. The French losses were 28,035. The Russians engaged numbered 132,000, and the French 133,000.

Though the losses were greater numerically than at Gettysburg, the percentage of loss is very much less.

The largest armies in modern history were marshaled at Leipsic, at the battle of nations, Oct. 16-19, 1813. The allies concentrated 330,000 men and Napoleon presented 175,000. The total losses were 80,000.

The Franco-Prussian war in 1870-71 was one of the greatest of European wars. The Germans took 797,950 men into France. Their loss in killed and wounded aggregated 3.1 per cent. In the Crimean war the allied armies lost 3.2 per cent in killed or death from wounds. In the war of 1866 Austria lost 2.6 per cent. In the American Civil war the Union army lost 4.6 per cent and the confederate army 9 per cent. History contains no record of a greater percentage of loss in killed.

LAST UNION SURVIVOR.

The last soldier in the war for the Union will have passed away by 1945, according to the calculation of the government pension bureau, based on actuary mortality statistics. This will be forty-one years hence, and eighty years after the close of the great war.

The last survivor of the war for independence was Daniel F. Bakeman, who died April 5, 1869, at Freedom, N. Y., aged 109, eighty-six years after that war closed. One veteran of the war of 1812 still survives, eighty-nine years after the close of the war. Veterans of the Mexican war are numerous. Survivors of the union army in the Civil war are estimated today at 858,002. This is how the government pension bureau estimates the survivors in the future:

Year.	Survivors.
1904	858,002
1905	820,687
1906	782,722
1907	744,196
1908	705,197
1909	665,832
1910	626,231
1915	429,727
1920	251,727
1925	116,073
1930	37,033
1935	6,296
1940	340
1945	0

HERO OF GALLOWS MIRACLE SOON TO BE GIVEN FREEDOM.

The annals of crime afford no more thrilling or grewsome scenes than those in which John Lee, now about to be released after twenty years of penal servitude, was an actor. A servant, he was convicted of murdering his mistress, an elderly woman of Devonshire. The motive suggested was that she had reduced his wages 12 cents a week.

When placed on the scaffold and the lever was pulled, the trap refused to work. Again the lever was pulled without avail. Then the hangman and warden, standing each side of Lee, tried to force the trap down, but failed. With the rope around his neck, Lee was marched aside, when the trap immediately opened. Lee was

again placed in position and again all efforts of the hangman and two warders failed to force the trap open, and amid a scene of terrible excitement, during which one warder fainted, the condemned man was again marched off, when the trap again worked without difficulty.

A third time this awful scene was enacted, with the same result, and the sheriff, unable to bear the strain any longer, ordered that the proceeding stop. On the facts being reported to the Home Secretary, he commuted Lee's sentence to penal servitude for life.

Lee himself acted like a dazed man, allowing himself to be led backward and forward mechanically. The only words he uttered were, "I am innocent."

No satisfactory explanation of the failure of the trap was ever given. A white pigeon fluttered round the scaffold during the attempts to hang him.

SOME REMARKABLE FEATS OF RAPID WORK.

In Austria a few years ago a complete hospital was built and was made ready to receive patients within an hour, a feat which seems almost impossible even when we know that all the component parts of the building were at hand. It was in Austria, too, that the seemingly miraculous task of converting trees into newspapers within two and a half hours was accomplished. At twenty-five minutes to eight o'clock in the morning three trees were cut down at Elsenthal. At twenty-six minutes to ten the trees had been stripped of bark, cut up and converted into pulp, made into paper and passed from the factory to the press, from which printed newspapers were issued at ten o'clock.

There are also some novel and astonishing feats in the production of books. Some years ago a publishing house in the western states received an order to produce 2,000 copies of a work of 350 pages, bound in cloth, in three days. The work began on Monday and on Wednesday afternoon the 2,000 volumes were handed over, while before Saturday no fewer than 10,000 had been turned out.

New York claims a publishing performance even more astonishing than this. An advance copy of one of Zola's works had been secured in Paris by the agent of the American firm, who posted it to New York. On its arrival it was translated into English, put into type, printed and bound, and was actually on sale within twenty-four hours.

Not long ago an English boot factory turned out a pair of men's shoes in the amazingly short space of time of twenty minutes. The shoes included, among other parts, two sewed pieces, two inner soles, two stiffenings, two pieces of steel to give a spring to the instep, two rands, two sole linings, twelve heel pieces, twenty upper pieces, thirty tacks, twelve nails in the heels and twenty buttons.

Remarkable feats of swift work are accomplished by those who have to do with moving railroad bridges and building railroads and locomotives. The new bridge for the Great Northern Railway of England at Finsbury Park was substituted for the old one in the short space of four hours. The work started at three o'clock in the afternoon, when powerful cranes were set to work to remove the ten ton girders of the

old bridge. The new steel bridge, weighing more than two thousand tons, which was resting near at hand on six small carriages, was hauled into position by steel crabs; it was rapidly made secure, the rails were connected and within four hours trains were running over it. A feat still more surprising was that of substituting a new bridge for the old one near Hatfield. Within fifty-two minutes the old structure, with its four lines of rails, had disappeared and in its place was a new iron girder bridge carrying six lines of rails, all ready for traffic.

A complete locomotive engine was put together for the Great Eastern Railway at the Stratford works in ten hours. The work began early in the morning, the engine being photographed at the different stages of its construction, and the same evening it was actually at work pulling a luggage train.

BOOK X

RECENT CREEDS DOCTRINES, FORMULAS AND FADS OF THOUGHT

A GENERAL REVIEW AND SPECIAL EXPLANATION OF BELIEFS PROFESSED BY LATELY FORMED SECTS, CULTS AND SOCIETIES NOW CLAIMING OUR ATTENTION

Mausoleum at Woodlawn Cemetery.

The dome is in cast bronze, including interior bracing, and weighs complete about 18 tons.

Recent Creeds, Doctrines, Formulas and Fads of Thought.

THE GENERAL PRINCIPLES OF SOCIALISM.

SOCIALISM stands for completed democracy; that is, absolute freedom under representative government that gives equal opportunities and rights to all. All its great leaders claim first for this plan a comprehensive system of public education. They all demand public ownership and management of all the instruments of production and distribution. They denounce as wholly unjust the division of the aggregate income of capital and labor which is made under the existing industrial system, and demand unanimously the adoption of a more equitable basis of distribution.

But, despite the general harmony of view regarding these leading principles, there is much discord within the socialist camp. Most of it arises over minor points, but much of it is due to differences over matters of fundamental importance. The German social democracy is menaced with a bad split. England has her "Social Democratic federation," her "Socialist league," her "Fabian society," her "Christian Social society," her "Guild of St. Matthew," and any number of lesser socialist organizations. In France there are "collectivists," "Blanquists," Broussist "possibilists," Allemanist "possibilists," "independents;" and one of these parties can hardly meet without being rent asunder. The socialists of the United States are fairly harmonious now, but their past history is largely a history of splits. Each of the numerous factions in the various countries represents a different shade of doctrine. It would take a book to elucidate all the diversities of socialism.

Running through the socialist ranks everywhere, however, is one line of cleavage which stands out most distinctly. This is the line which in every country divides the "opportunist," or "reformist," from the "scientific," or "revolutionary," socialists. The revolutionary socialists are led in Germany by Bebel and Liebknecht, in France by Guesde and Lafargue, in Italy by Ferri, in England by Hyndman. The opportunists are led in Germany by Bernstein and Vollmar, in France by Jaures and Millerand, in Italy by Turati, in England by Kier Hardie. The socialist party in the United States is dominated by revolutionary sentiment and by revolutionary leaders, such as Eugene V. Debs and A. M. Simons of Chicago, the able editor of the International Socialist Review.

The revolutionists, who are usually devout believers in the entire gospel according to Marx, maintain that the socialist propaganda is a war of the laboring class, or proletariat, against all other classes of society. They would, therefore, organize the proletarians into a party from which all other persons are barred, so that when, in the course of industrial revolution, the

capitalistic system breaks down, the proletarians will be ready to seize the instruments of production and distribution and begin managing them in the interest of the whole people. Meantime, they would have socialists accept no favors from or offices—except for the purposes of agitation—under governments which they regard as capitalistic, but would have them stand aloof and wage unrelenting war against established institutions. Opportunists believe, on the contrary, that the interests of all classes are pretty much the same. They deprecate class war, and would debar nobody from socialist ranks. The revolutionists would accomplish the change to socialism, without violence, if possible, but quite suddenly. The opportunists, as their name implies, would welcome every gain, however slight, for socialism, and would bring the new régime to pass by slow, almost imperceptible, degrees.

As would naturally be expected, England, the classic land of liberty, practical philosophy, and opportunism, is the happy hunting ground of the reformists. There is less socialism in theory and more in practice in that country than in any other in the world. The English national and municipal governments do everything, from delivering the mails and operating street railways to running pawnshops and cow meadows and furnishing midwives. The revolutionary socialists, as would also be anticipated, are strongest in Germany, whose philosophy has always been theoretical and idealistic, and whose government has always been despotic.

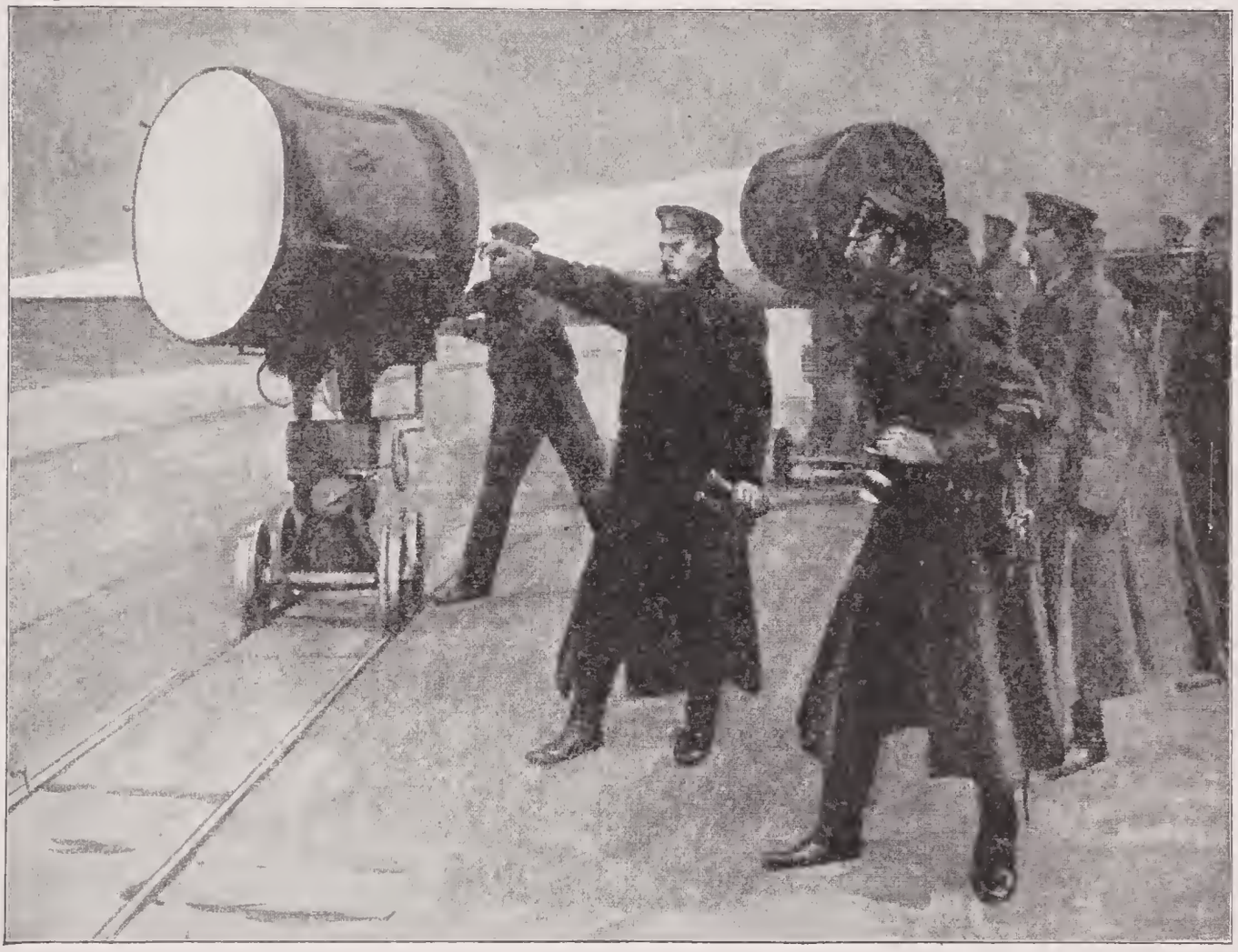
The revolutionists believe, with Marx and Engels, that government will be practically abolished under socialism. "The state's seizure of the means of production in the name of society," says Engels, "is * * * its last independent act as a state." There will be no cabinets, parliaments, standing armies, police, courts, attorneys, or taxation under socialism, according to Bebel, the German leader. Their place will be taken by administrative boards. This view seems largely a reaction against the tyranny of European —and especially of the German—governments. It seldom appears in the talk or books of the English Fabians and other reformist socialists.

The question which causes the most severe dissension among socialists on the continent of Europe is as to what position they shall take in reference to the land problem. Land is one of the chief instruments of production, and the strict Marxian doctrine is that it, like every other form of private capital, must be appropriated and managed by and for the public or "collectivity." The peasant farmers of Germany, France, and Italy, who own the little patches of land they cultivate, love them as they do their wives and babes; and fear of loss of their small properties has caused them almost to a man to oppose socialism. The peasant proprietors are numerous, and socialism can hardly win against their opposition. The opportunists would meet the difficulty by telling the peasants that private property in land will not be disturbed under a socialist régime until the tendency of capital to centralize shall have vested ownership of it in a few hands. The revolutionists oppose giving any such assurances. They would have land seized along with stores, manufactures, and other instruments of production.

The socialists of England are not troubled by this agrarian question. Ownership of the land in England, like ownership of its manufactures, is already centralized in a few hands. There are no peasant farmers to "expropriate." Immediate public ownership, or "nationalization" of land, is consequently as fundamental a tenet in the creed of the English opportunist as it is in that of the German or French rtvolutionist.

On most points the socialists of the United States are in harmony with the revolutionary socialists of Germany.

Whether they will follow them and the English socialists on the land question is a matter for interesting conjecture. American socialist leaders plainly see that for their party to declare flatly for immediate public ownership of arable land would be to gain the hostility of all the millions of American farmers who own their farms. How to be consistent in their principles and yet not array the farmers against them is a problem which, as one of them admitted the other day, is "keeping American socialist leaders awake nights."



Search lights at Port Arthur sweeping the sea to discover Japanese torpedo boats.

The chief aim of socialists is a more equitable system of distribution of the produce of society, but there is no agreement among them as to what system shall

be adopted. Saint Simon favored rewarding each person according to his capacity. Louis Blanc advocated giving to each according to his needs. Many socialists believe all should receive the same income. The more orthodox Marxists do not tackle the problem of distribution, but content themselves with the fatalistic position that the same process of evolution which is tending to vest the ownership and management of the instruments of production in the collectivity will also work out an equitable scheme for dividing the products.

COMMUNISM IN BOLIVIA.

On any map of Bolivia you will find a big white space in the southeastern part of it. This large region has been neglected by explorers and all other white men, excepting a handful of Bolivians, rubber collectors and a few missionaries. It was not known until this fall what interesting things are to be found in this forgotten corner.

Captain Jerrmann, a well-known geographer, who has been studying rubber resources of South America, has written for Petermann's Mitteilungen some remarkable facts about this region. He could find no map to help him on his journey, and the route map he carefully prepared gives much fresh information.

Most people have thought of Bolivia, since the war with Chile in 1879 deprived her of a port on the Pacific ocean, as being without any port through which she might exchange commodities directly with the rest of the world. But Jerrmann found that the republic has made a port of her frontier town, Puerto Suarez, on the Paraguay river.

The name of this town is not found on some of the latest maps, and yet the town is now engaged in foreign trade. The goods are brought by ocean steamers into the Rio Plata, transferred to river steamboats, and carried up the Paraguay to Puerto Suarez, where they pass through the custom house just as though they had entered a great Bolivian seaport.

These goods would be of little use, as they are hundreds of miles from the settled parts of Bolivia, unless excellent means of transporting them were provided. The common wagon roads of South America are among the worst in the world, but the Bolivians have built a road over 100 miles westward from their port which will compare favorably with the good roads of other countries. Jerrmann calls the government of the republic tyrannical, and says it has used the privilege it chooses to exercise to compel the people to work in the government service for a mere pittance, and thus has provided an excellent road at very small cost.

The road winds westward for over one hundred miles through the valleys and forests until it reaches the navigable part of a stream flowing into the Rio Grande. The boxes are transferred from the wagons to small boats, which carry them to the northwest, and they are finally distributed to the leading towns of the country.

To reach the rubber district Jerrmann had to leave the good wagon road and strike north along a narrow and tortuous path through the dense forests. On his

way he came to the country of the Guarayo Indians, of whom he gives the best account yet written.

Their name means Yellow Men, and they have really an extremely light complexion. The Guarayo holds himself superior to the Caucasian, and it can not be denied that in uprightness and sturdy character he compares favorably with more civilized peoples.

The tribe, which numbers only a few thousand souls, has become known simply because of one peculiarity: Its life is ordered on the communistic plan.

Everybody works, not for himself, but for the common good. The people have a number of small settlements and four large ones, and are ruled with a rod of iron by their caciques.

They derived their communistic idea from the Jesuit fathers who lived among them several centuries ago. They have enlarged these ideas according to their own notions and believe that by serving all each may contribute better than in any other way to his own well being and that of his tribe.

The smaller settlements are divided into two sections, the larger towns into four, and in San Ignacio there are eight sections. The supreme head of the people in each section is a cacique, who has under him a superintendent, a judge and a secretary, the last keeping a written record so that an account of all the affairs of the section becomes part of its history.

There are also a number of superintendents of labor, one of them having under his direction the men who distribute the water, another squad supplying firewood, others attending to all the farm work. Every man detailed for farming has a plot of ground, for whose careful cultivation he is held responsible. The crops he harvests go into the common store to the last pound or bushel, but the man is punished if it is decided that the yield from his patch is less than it would have been if his industry had been greater.

If the house of one of the tribe is burned it is replaced at public cost. Thus throughout their lives in every way each shares the good and bad fortune of his neighbors.

The cacique is an absolute ruler, and disobedience to his will is severely punished. Laziness is one of the worst of crimes and the penalty inflicted is often several hundred blows well put on the naked back with a leather strap. Even the women are punished in this way, receiving sometimes as many as fifty strokes.

Discipline is remarkably severe. No one may leave his section without permission. No one may entertain a stranger unless the cacique consents.

No one may marry outside of the tribe under any circumstances, nor take a wife in another section of his tribe without the consent of the caciques of both sections. It is interesting to have these further details about this little group of South American Indians, whose peculiar and somewhat advanced civilization had already carried their name abroad.

Jerrmann at last reached the rubber fields after traveling many days through the dense forests. The tree is the *Hevea brasiliensis*, the same plant that yields the famous Para rubber in the Amazon basin, and Bolivia is supplying more and more of this superior rubber every year. The tree is known among the rubber collectors as the seringa.

The explorer mentions a very curious fact concerning the search for other rubber fields in these great forests. The groups of rubber trees are scattered only here and there among the timber, and men are kept constantly in the field in search of more trees.

This work is not without danger, for there are perils of wild beasts and of fever and many of the Indians are not friendly. The prospectors therefore travel in small parties, spreading out within hearing distance of one another during their day's toil.

A little bird with a sweet flutelike note is found in these groves of rubber trees, and, strange to say, it is not known to live outside of them. So the rubber collectors have given it the name of seringero. As the prospectors push forward through the bush they listen for the familiar "huwiet, huwitt, huwee" of the little bird.

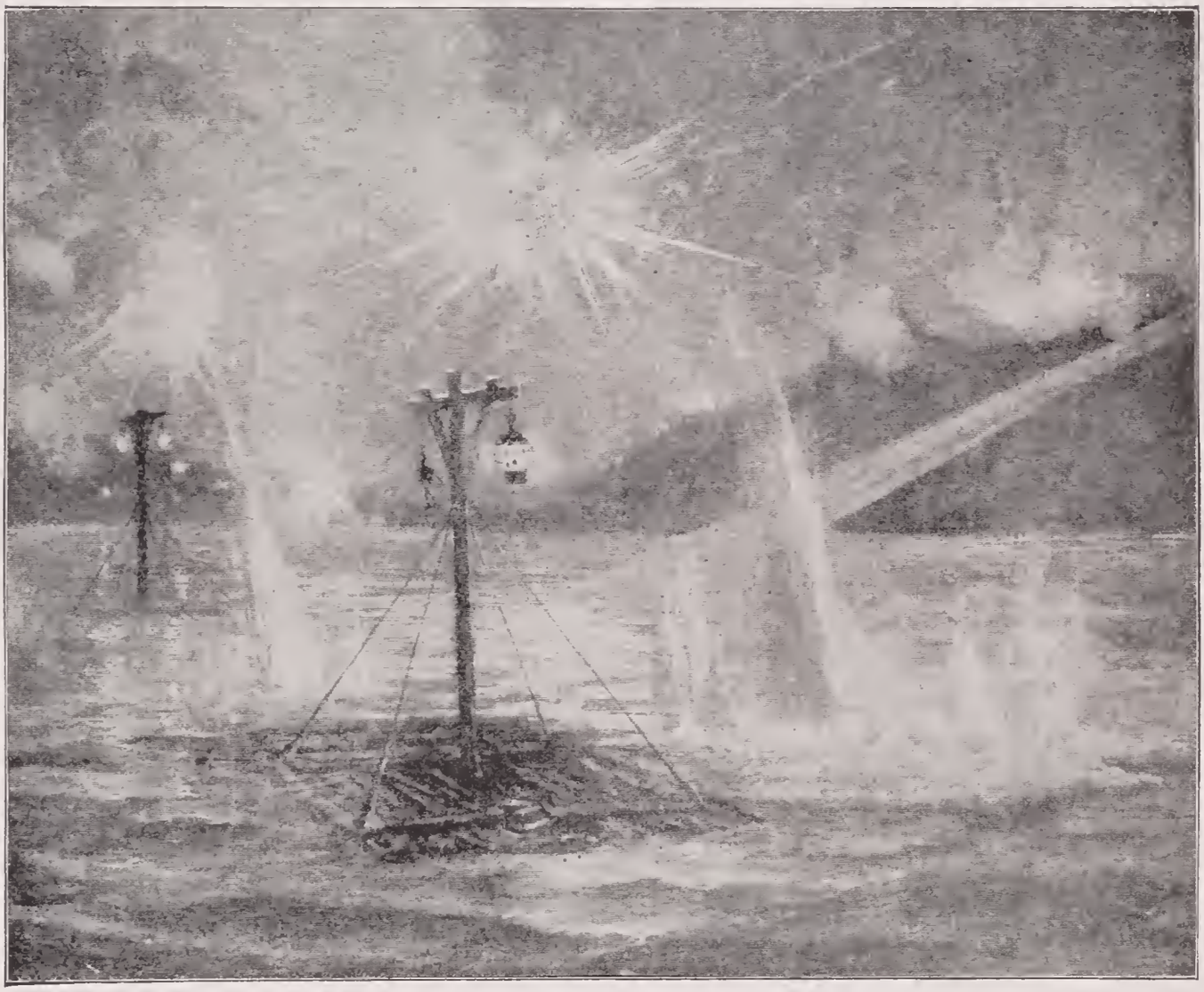
When a hunter hears the characteristic cry among the trees ahead of him he raises a glad shout that reaches his brethren through the woods.

"Come here!" he cries. "I hear the seringero singing; and here are the trees."

THE DOUKHOBORS.

A remarkable community of Christian socialists, driven by persecution from Russia a few years ago, is now thriving and prospering rapidly in their settlement near Yorkton, District of East Assiniboia, Canadian Northwest. In 1902 their fanatical pilgrimage in search of the coming Christ aroused general attention toward them. If the Canadian authorities had not dealt firmly though indulgently with them at that time, hunger and cold would have reduced their numbers by many hundreds, and the settlement would have been broken up. They wandered about naked or half clad, and their wrong interpretation of isolated texts of Scripture led them to discard the use of animals in their farm work and to other absurd practices which made life impossible in an agricultural district. A special newspaper correspondent, who has recently made a thorough investigation of the settlement, reports that fanaticism has been practically eliminated, and that the Doukhobors are settling down to a most interesting realization of their peculiar notions. They have forty-five villages in a block of six townships, and they number between eight and ten thousand people. Each village contains about two hundred people and is a complete little community in itself, with its blacksmith, its carpenter, stables, mill, grocery or other shop necessary to the life of the village. Money and even barter are blissfully unknown here. The Doukhobor farmer or housewife goes to the head man of the village and gets boots, clothing, and groceries for nothing. Work is done by every one without money and without price for every one else. When the year's crops are sold, or when the earnings of Doukhobors who are sometimes employed on railways or other enterprises outside the villages are paid, the money is put in a common purse, and with this money four commissioners go to Winnipeg and buy supplies for the community wholesale. They could not do otherwise on principle, for the middleman's profit is to them as

flat robbery as ever was committed. They have no marriage laws, although in practice almost every man lives and dies the husband of one wife. They firmly refuse to register births, marriages, and deaths, decline to "make soldier," as they phrase their primitive methods. Steam plows, steam threshing machines, traction engines and all the other improvements founds on the best-managed farms are used in the Doukhobor settlement. As a result they are thriving remarkably. Unselfish and



RUSSIAN FORTS FIRING AT THE DUMMY LIGHTS SENT IN BY THE JAPANESE.
The false lights were rigged up on rough rafts, and the lights were hung to represent those of a ship. They were towed into position by torpedo-boats, and then let drift with the tide.

military service, and are cleanly in their personal habits.

With all this quaintness and paradox they have a keen perception of practical advantage and a progressive spirit that are surprising. Up-to-date machinery and implements of all kinds have replaced trustful among themselves, they have nevertheless become noted as keen bargainers with outsiders, so much so that in some cases they have acquired an unenviable reputation in this respect. Their wholesale purchases of supplies have always been made with a keen eye to the

main chance, and the Winnipeg merchant has a thorough appreciation of his canny customers. Apart from that accentuated propensity, however, there is little that is objectionable in their attitude toward their neighbors, while the interesting nature of their experiment is attracting much attention. They owe much of their recent success to the wise leadership of Peter Verigin, their ablest man, who has moderated their fanaticism and induced them to adopt modern methods of industry. There are still extremists among them, but they are in such a small minority that they are powerless to injure the settlement. Verigin, who is a personal friend of Tolstoy, is believed to have been strongly influenced by the great Russian writer in the management of the settlement, and came to his present position through experience of much tribulation, having spent fifteen years in Siberian prisons on account of his fidelity to Doukhobor principles.

THE AMANA SOCIETY.

This eminently successful communistic settlement celebrated the semi-centenary of its Iowa establishment 1905. But the Amana society itself is much older. The sect was founded in Germany 190 years ago. It thrived in the Fatherland for a century and a quarter, and then came across the waters to establish itself in the New World. For a dozen years the Amanites made their home in western New York, but in 1855 the advance guard crossed the Mississippi river and established the new colony in Iowa county. For a half century it has thrived,—the most successful communistic settlement in America. Today the colony numbers almost 2,000 inhabitants, owning property valued at about two million dollars.

The flight of time has not affected the quiet, easy-going, devoted Amanites. Their life today is as simple and as wholesome as it was fifty years ago. In the midst of a bustling, thriving community, with development and change round about them everywhere, they have gone ahead in the ways of the founders of the society, content that what was good for their forbears is good for themselves, yet prospering and enjoying life in a pure-hearted, clear-brained way.

The world comes to gaze curiously at these quiet people, and the young people in Amana must needs be attracted by the strangers to the cities from which they come, and soon they will grow restless and long for the kind of clothes the visitors wear, and before long they will leave the quiet and peace of Amana for the whirl and bustle of life in the great cities. What honor and respect are due these simple people, who, while all around them strive for money and position, are content to live as Christ did so long ago, not only professing to believe, but really doing to others as they would have others do to them.

Many erroneous ideas prevail in regard to the conduct of the Amana society and the manner of life there. Here is an outline sketch of the settlement:

The Amana Society, or the Community of True Inspiration, is purely a religious one. The members accept the ordinary Christian beliefs, practice the customs of

primitive Christians, and believe in the continuity of inspiration. The foundation of their life is religion, and from that grows the community of goods. Marriage is permitted, but not unduly encouraged in the very young, an age limit being placed for betrothal, which can be followed by marriage in not less than a year.

The chief occupations are agriculture and the manufacture of woolens and calico, and for the manufacture of these goods the community has an enviable reputation. Work is found for every one, and the children and the aged are not permitted to labor beyond their strength or years. Education is compulsory, and holidays are rare, the children spending at work the hours not passed in study.

Among these quiet people, where no more work is attempted than can be easily accomplished, where every one can have work, and where every one does work, strikes are unknown. Every one is busy, and as the workers grow old, lighter employment is provided for them.

The Amana houses have the appearance of those seen now in Germany, and the neatness of each little place, with the garden brilliant with flowers, shows the German blood and training of the inhabitants. Each family has its own garden, and whatever is raised in it belongs to the family for use, or for disposal, after the needs have been supplied. At the common store, a certain amount is credited for each family, varying according to the need, size and position of family.

THE SHAKER BUDDHISTS.

Near Los Gatos, Cal., in the Santa Cruz mountains, is "Skyland," the new home of a brand new sect known as the Shaker Buddhists. There are prominent people connected with the sect, and the vice-president, or assistant high priestess of this new religion, is Marie Corelli, author, and William T. Stead, the editor, also high in its councils.

"Mother Alice," who recently visited San Francisco, is, if not the founder, the high priestess of the new cult. According to her own story, she has traveled the wide world looking for a place where the Shaker Buddhists can live in comfort, and where they can contemplate nature in all its varied beauties.

The Shaker Buddhists believe that in lovely surroundings they can improve their minds and so fit themselves for the higher life. In "Skyland," where all the conditions are as near to perfection as they can possibly be in the terrestrial sphere, "Mother Alice" hopes the devotees will approach that mental and also that physical perfection which is the aim of all Buddhists, whether they live in Ceylon or on the snow-clad peaks of the Himalayas.

These people do not believe in "sex." They are not material. They have no passions. They live in too high a plane to be enervated, or to be swayed by the feelings that animate and sometimes exercise so pernicious an influence on other individuals.

"Mother Alice," after a long search for an earthly paradise for the new sect, feels that her quest has been rewarded, and that the place that can afford the Shaker

Buddhists that peace and quiet for the contemplation of higher things is in "Skyland," in the Santa Cruz mountains. There, she is confident, the Shaker Buddhists will come from all quarters of the world to study "the things that are not." There is, it must be said, however, a material side to these devotees of perfection and things beautiful. The Shaker Buddhists must eat as do other people, and they are now building huge ovens in which to prepare health foods. Even a life of self-abnegation has to be fed with something beyond the thinking of exalted ideals, though those who have had an insight into the preparation of these so-called health foods declare that they are well calculated to produce dreams of a high order.

"Mother Alice" is a good-looking woman. She wears a long gown of unbleached linen and a peculiar coiffure instead of a hat. She also wears a compass and a band of silk on which are the emblems of hope. She claims that the cult is the "Order of the Sons of Jerusalem." "Mother Alice" is an English woman and was at one time engaged in literary work. She is confident that there will be several hundreds of Shaker Buddhists in California before another year has passed by, and believes that they will have the most delightful home in the world in "Skyland," in the Santa Cruz mountains.

THE DIVINE LIFE ASSOCIATION.

A little band of worshippers who term themselves the Divine Life Association gathers thrice weekly in a vacant store in Brooklyn to sing and to pray and to listen to the preaching of the Rev. W. Henry Lannin, who terms himself their truth instructor and leader. This church (for the members declare that it is not a mission in any sense), is, perhaps, unique among religious bodies. It has no affiliation with any other body, although it has been in existence about one year, and the services are unsectarian and fraternal.

"Why did we select the name Divine Life?" said the leader, the Rev. Mr. Lannin, when asked about the association. "Simply because we like those words. Divine Life! Can you think of anything grander than that? They mean all in all."

The Rev. Mr. Lannin admits that his little church has not made much progress during its twelve months' existence, but he has not yet lost hope that some day he will see a fine edifice erected to house the flock which now numbers but little more than a score. He is not especially well blessed with funds, although he has a good friend in an elderly woman, who has sustained the work financially, and he has turned his attention, during odd moments, to painting in oils, and has completed several works, which have been placed on exhibition in one of the up-town art stores. The leader continues to take instruction in art and hopes in this manner to add to his income until such time as his flock is able to contribute to his support.

At present, and for some months past, Mr. Lannin has made his home in a small room in the rear of the building, where he instructs and preaches. This is comfortably furnished with a small stove, folding bed, sofa, and the like, and here the instructor sleeps and eats the meals he pre-

"The genius of the Japanese for preserving secrecy in all that pertains to military operations is exemplified by the manner in which they mask all their positions, both for guns and men. The howitzers, which furnished such a terrible surprise to the Russians during the battle of the Passage of the Yalu, were situated on Kintato Island, and were emplaced in pits dug in the sand, in front of which enormous balks of timber had been sunk upright in the ground and covered with boughs of trees and scrub lashed to the timber by grass ropes. At a very slight distance these erections could not be distinguished from the surrounding trees, and the high angle of fire precluded the flash of the guns—using smokeless powder—from being observed by the enemy."

pares. He says the work is rather discouraging, but, if a bit cast down he plunges into literary efforts and soon forgets his struggles.

Mr. Lannin has already a number of small books published, and he has the manuscript for several more ready for the press, and is now looking for a printer. Most of his works have been along historical, scientific, astronomical and astrological lines. One of the manuscripts for which he is now looking for a publisher is entitled "From Chaos to Cosmos; or the Earth's Birth in Sacred History and Science." Another is "Arcana Caelestra; or The Secrets of the Heavens Recalled."

He has fifty lectures prepared on quite scientific subjects, but he does not get the appreciative audiences he desires and has therefore laid them away for the present. As a stenographer Mr. Lannin says he is qualified to teach one or more of the standard systems. He has also a certificate telling that he is a proofreader of no mean reputation. And yet, for all this, Mr. Lannin prefers to devote most of his time to teaching the little band whom he leads.

Mr. Lannin says he has traveled extensively in this country and in England and France. That was when his finances were in the ascendency. Mr. Lannin is a native of Canada and has labored in cities from Maine to California. But that was when he was a minister of the Advent Christian church, to which he was ordained fifteen years ago. His home is in Boston where, not long ago, he says, he declined a call to a church paying its pastor a salary of $6,000 a year.

Mr. Lannin came to Brooklyn from Harlem, where he was laboring to establish an Advent church about a year ago. Previous to going to Harlem he was pastor of the Advent church in Bridgeport, Conn.

Asked why he had left the Advent church to found another church, which knew neither sect nor denomination, Mr. Lannin said he was not pleased with some of the doings of the church today. He characterized the methods resorted to by some churches to raise funds as outrageous. The true believer, the man who had the faith, would never be in want, he said. So it was with the church if it lived up to the teachings of the Bible.

"We welcome all believers," said Mr. Lannin. "No applicant whose name is enrolled in membership with any other assembly of believers will be called upon to relinquish such membership. The spirit governing the loyal to Christ Association is distinctively an interlinking one. Its purpose is toward coalescence, not cleavage.

"To become a member of our little body one has but to sign the following application, and the superintendent will issue a certificate of merbership, incorporated in which is this:

(1) The present time, as I view it, is weighted with a spirit of laxity in the realm of morals, while faith in God's revealed grace (favor), in Christ is woefully waning.

(2) I believe that loyalty to Christ should inspire every believer's mind and heart; and also an unsectarian unity of loving action is everywhere needed and demanded.

(3) That I may become, as opportunity allows, a more efficient follower and self-sacrificing servant of Christ, my Lord, pursuing my pilgrimage among men

in, if possible, a more resolute, devoted and zealous manner of life, cultivating the garden of my soul so that the sweet "fruit of the spirit" may not be wanting therein.

I acknowledge to having repented (sorrowed for and turned from) all known sinful ways, and to having heartily accepted the divine Father's pardoning mercy and love as made known in Christ Jesus, the sinner's reconciling Savior and Mediator.

The certificate referred to states that the person receiving same is recognized as "a sincere-minded member of the above association, conjointly with its associated membership privilege to participate in all the benefits for which the association exists; as, also to heartily assist in the advancing of its ennobling principles in the midst of men for their earthly and eternal good, *Deus est summum bonum* (God is the supreme good).

"This associate fellowship will remain so long as the holder of the certificate manifests by word and act a spirit of piety and love toward the possession of those principles which are honoring to man as also praiseworthy before God."

Mr. Lannin says he has made a study of spiritualism and has discovered that much of the work is "largely a hideous fake."

SPIRITUALISM RECENTLY ORGANIZED INTO AN ECCLESIASTICAL BODY.

"People now believe in the Bible because of spiritualism; they do not believe in spiritualism because of the Bible.

"Take up your Bible and you will find that there is not a single phenomenon which is recorded there which does not occur at seances today."

These words from the Rev. H. R. Haweis in an address before the London Spiritualistic Alliance, are prominently set forth in the enunciation of the First Spiritual Church of Brooklyn. The enunciation of the church is to be issued for the first time today. It corresponds to the articles of faith and belief of the Evangelical Church, in purpose, but in subject matter is as different as is an actor's prompt book from a harmony of the four gospels. This enunciation is a voluminous work and has been compiled, written and planned by Judge A. H. Dailey, one of the pillars of the new church, at the expense of long study, frequent conferences with the brethren, earnest and prayerful thought and at no small amount of labor.

In the opening paragraph the possibility of making "changes from time to time, as greater wisdom shall advise, in the objects and purposes; the principles upon which we stand, and the scope of our work" is provided for. The first reference to spiritualism as it is usually understood is made in Articles IV, V, and VI, which are as follows:

"We believe that that which is good and true in all religions should be sustained by all possible available knowledge, and that neither doctrines nor creeds should stay legitimate investigation into spiritual truths—the manifestation of spiritual powers, nor the promulgation of a religion incorporating all that is essentially true in those respects.

"We believe that the time is ripe for the incorporation into the doctrines and tenets of all truth desiring religious organizations, an acceptance of the fact of spiritual communication between the physical and spiritual worlds, and in the absence of such acceptance, that wherever practicable, religious organizations should be formed which shall recognize such communion.

"We include in the basis upon which he shall build, all essential truth, whether incorporated or not in other religions of mankind, and declare it to be our purpose to ascertain and make known, what is true, especially of that which pertains to the spiritual nature of man, his psychic powers and possibilities, his relations to the spiritual world, and to encourage the judicious cultivation of spiritual gifts."

Much stress is laid upon the utterances of the great and wise, in ancient and modern times in this enunciation. Some space is devoted to the direct teachings of Christ, leading with the beatitudes from His sermon on the mount. To the words of Paul, the apostle, bearing upon "the manifestation of the Spirit," and to "diversities of gifts," more space is given than to the teachings of the Nazarene.

Many are the extracts from the Acts of the Apostles, in which the "spirits," both good and bad, are referred to and wherein "visions" are described. Following are quotations from the Old Testament referring to the abuse of the psychic power among the Israelites. Five hundred and ninety-four years before the Christian era, Ezekiel, a seer and prophet among the Jews, wrote:

"And the word of the Lord came unto me, saying, Son of man, prophesy against the prophets of Israel that prophesy and say unto them that prophesy out of their own hearts, hear ye the word of the Lord.

"Thus saith the Lord God, unto the foolish prophets that follow their own spirit, and have seen nothing. O, Israel: thy prophets are like the foxes in the desert. Ye have not gone up into the gaps, neither made up the hedge for the house of Israel to stand in the battle, in the day of the Lord. They have seen vanity and lying divination, saying 'The Lord,' and the Lord hath not sent them: and they have made others to hope that they would confirm the word.

"Have ye not seen a vain vision, and have ye not spoken a lying divination, whereas ye say, The Lord saith it: albeit I have not spoken? Therefore, thus saith the Lord God, because ye have spoken vanity and seen lies, therefore, behold, I am against you, saith the Lord God. And my hand shall be upon the prophets that see vanity, and divine lies: they shall not be in the assembly of my people, neither shall they be written in the writing of the house of Israel: neither shall they enter into the land of Israel: and ye shall know that I am the Lord God."

"Likewise, thou son of man, set thy face against the daughters of thy people, which prophesy out of their own hearts: and prophesy against them, and say, thus saith the Lord God: Woe to the women that sew pillows to all arm holes and make kerchiefs upon the heads of every stature to hunt souls! Will ye hunt the souls of my people, and will ye save the souls that come unto you? And will ye pollute me among my people for handfuls of barley, for pieces of bread, to slay the souls that should not die, and to save the souls alive that should not live, by your lying to my

A Russian Field Railway Crossing an Icebound River.

In cases like this the sleepers are very long, so that the weight may be well distributed.

people, by your lying to my people that hear your lies?"

"Because with lies, ye have made the heart of the righteous sad, whom I have not made sad: and strengthened the hands of the wicked that he should not return from his wicked way, by promising life: therefore, ye shall see no more vanity nor divinations: for I will deliver my people out of your hands, and ye shall know that I am the Lord."

"Whither shall I go from thy spirit? Or whither shall I flee from thy presence? If I ascend up into heaven, thou art there: if I make my bed in hell, behold thou art there. If I take the wings of the morning and dwell in the uttermost part of the sea, even there shall thy hand lead me and thy right hand shall hold me."—Ezekiel xiii.

The Egyptian "Book of the Dead" has been drawn from for this creed, to show the thought of the ancient Egyptians in predicting the Christian era thousands of years before its dawn. The poetic translations from the ancient Hindu sacred books have yielded their pages, also, to show the conceptions of those people on "First Cause." Then "Haunted Houses," the poem by Henry W. Longfellow, is used in full, only to be followed by this quotation from Gerald Massey: "The Spiritualist who has plumbed the void of death as I have, and touched this solid ground of fact, has established a faith that can neither be undermined nor overthrown. He has done with the poetry of desolation and despair, the sighs of unavailing regret, and the passionate wailing of unfruitful pain. He can not be bereaved in soul!"

The enunciation declares:

"The conclusion is being forced upon thoughtful and inquiring minds that, as the Rev. George H. Hepworth says:

" 'There are more beings who are invisible than there are beings visible, and that the visible and the invisible are supplied with means of communicating with each other. * * * God has not changed His relation to men, and the necessities of human nature are just as urgent as ever. If angels talked with mortals from the time of Adam to the days succeeding the crucifixion, it is folly to suppose that the curtain dropped and we have ever since been left without the companionship of a "cloud of witnesses." We must either throw the Bible overboard as a tissue of imaginary events, or believe, as every generation has believed, that the great falsehood of history is that there is "a bourne from whence no traveler returns." * * * It is useless for the Christian to declare that such miracles, if they are miracles, were confined to the limits of a given period. He must accept what happens today as well as what happened centuries ago. If God is really a presence in the world, then He must be a continuously revealing presence. There is a kind of absurdity in the statement that He has spoken but refuses to do so any more. If He ever spoke, it is certainly true that He still speaks. * * * It is an inexpressible loss to the religious life that we do not realize the radiant fact that the solicitations and helpful influences are round about us in our struggle with circumstances. Every loved one who has gone is as conscious of our doubts and fears as when he was at our side. Neither his affection nor his power to aid has been abated. In a thousand ways unknown to

us, he gives us strength for the conflict and peace of mind in our perplexity. By unspoken words he talks with us, and our soul and his hold intimate communion. Were that not true, then our lives would be heavily and darkly overshadowed. But it is true, and we are compelled by many an unexplained experience to believe it. It is a doctrine of Holy Writ; it is verified by the history of every home; it is a component part of practical religion; it is a statement of fact which redeems us from despair and gives us good cheer, because heaven and we are not far apart."

Ralph Waldo Emerson has also been drawn from, as have Henry Ward Beecher, Robert Burns, Mozart and others.

Throughout the whole enunciation, long quotations have been drawn from the work of F. W. H. Myers' "Human Personality and Its Survival of Bodily Death."

Many of the commands given to Old Testament characters to obey the instructions of the "voices within" are cited and emphasized, but they are those used by E. W. and M. H. Wallis in "Spiritualism in the Bible."

The constitution and by-laws of this band of "children of light" show that they have profited by the wisdom of " the children of this day and generation" in the conduct of business affairs.

ARTICLE II.

Section 1. Any person of the age of twelve years shall be eligible to membership. Members shall be of two classes, namely, co-operative and active members. A person can only become an active member by being first proposed by an active member, or upon personal application. In each instance after the organization is completed, the application shall be in writing, stating the full age, name and residence of the applicant, with references to at least two persons willing to certify to the integrity, good moral character, temperate habits and peace-loving nature of the applicant. The application shall be submitted to the board of trustees, and by this board referred to the committee on membership, who shall investigate and report within two weeks thereafter as to the qualifications of the applicant to board of trustees, who shall submit the same to the pastor for approval.

ARTICLE X.

Section 1. Every member, whether active or co-operative, shall pay such annual membership fee as shall be fixed by the board of trustees, quarter yearly in advance.

Section 2. Any member six months in arrears for dues shall not be entitled to a vote in the annual election of officers, and every member one year in arrears for dues may, at the option of the board of trustees, be dropped from the roll of members.

The pledge of membership follows:

We, whose names are subscribed hereto, severally state that by so doing we severally become members of this, the First Spiritual Church of Brooklyn, and that we will in all things conform our lives, to the best of our ability, to the requirements of its constitution, laws and ordinances, that we will avoid all causes of scandal or reproach, and will sacredly guard the fair name and fame of this church, of its pastors, officers, teachers

and members from injustice and wrong to the extent of our power to do so; that we will be energetic to promote the prosperity of the church and the welfare of its members, remembering always the great truths contained in the enunciation upon which this church is founded.

The Rev. May S. Pepper is the pastor of the First Spiritual Church in Brooklyn.

RELIGIOUS FREAKS IN THE ORIENT.

The religious sentiment of the orientals has found expression in a variety of "quaint and curious" and often grotesque images and structures designed to promote piety among the pagan sects. Some of the most notable of these peculiar constructions are to be credited to the religious impulse of the believers in Buddhism. At Rangoon, Burmah, in British India, is to be seen the largest figure of Buddha ever made. It represents that great teacher and leader in a reclining attitude, and it is 200 feet long and fifty feet broad between the shoulders. A man standing on one of the hands of the figure appears in contrast like a pigmy. Near Yokohama, Japan, stands a colossal statue of Buddha, which is the finest specimen of sculpture in bronze to be found in the Mikado's empire.

Some remarkable Buddhist pagodas, or shrines of worship, have been erected in Burmah. One of these, the Sampan Pagoda, is built upon a huge rocking stone situated on top of a mountainous rock. This place is the resort yearly of thousands of pilgrims who are supposed to acquire much merit for journeying thither from their distant homes. On reaching the scene they offer fervent prayers, and then, bracing up against the big foundation stone of the little edifice, strive to rock it to and fro. If the stone moves freely it is regarded as a sure sign that the supplications of the believers will be answered. The Cheyteyo Pagoda is another of these extraordinary shrines. It is said to rank as the first of Burmah's architectural curiosities. It caps an immense loose bowlder lodged on the very edge of the cliff, 4,000 feet above the valley below, and seemingly held there by supernatural power. To the eye of the observer there is nothing to keep this bowlder from slipping off and plunging down the precipice four-fifths of a mile, with the petty temple and the worshipers gathered about it. That no merely natural cause prevents such a catastrophe is clear to the devotees, for it is believed that relics —real hairs—of Buddha are preserved under the mighty stone so fearfully poised. In front of the pagoda there is a mass of hair cut from the heads of pilgrims as a sacrificial offering. The faith of those who congregate there is so great that after due prayers they are ready to face any calamity, and death itself, bravely and even exultantly.

The superstition of the Burmans is also exhibited in the practice at their festivals of carrying about a hideous and gigantic effigy of a harper, in order to propitiate the evil spirits, which are, it is fancied, fond of music.

Winter as the Russians' relentless foe in Manchuria. The retreat out of Korea.

FORTUNE TELLING.—OPINIONS OF A NOTED SCIENTIST.

Of late days there have been weeping and wailing in the camp of the palmists, the crystal-gazers, and other varieties of modern soothsayers. A recent trial in London must have opened the eyes of the world to the real nature of the practices in which the race of sibyls and professors of the occult are accustomed to indulge by way of extracting "the ready dollar" from the public purse. Personally, I rejoice in the exposure, because the whole of the sorry evidence given at the trial reveals the true nature of so-called occultism and places palmistry on its true level as a system of absolute quackery. One astonishing feature is that represented by the credulity which causes otherwise sensible people to expect an ordinary mortal, similar in constitution to themselves, to be able to forecast the future, and also to display a singular knowledge of the past, of people who are perfect strangers to the palmist.

I take no account of certain impressionable minds which are ready to believe anything. These are the people, who, after an interview with a soothsayer, will tell you marvelous stories of his or her powers. The recital is made up of impressions of what the subject thought the palmist said, not of what he really declared. Hence it is this particular class of subject who is responsible for a good deal of the false fame which attaches itself to the palmist's declarations. As for the crystal-gazing, and the like, when we find the operator making false shots by the score, telling people who are married that they will meet their "fate" in the shape of the right man or woman in a few weeks, and otherwise talking arrant nonsense, we may well be disposed to regard the recent trial as an event likely to exert a very beneficent effect on public opinion.

I have had personal experiences of palmists, led to such investigations by way of ascertaining if their results were in accordance with the stories of their success. I avow that in no one instance was I satisfied at all. There were chance shots which went near the mark; all the rest was mere vaporing. One lady professor said I was "most unsympathetic." She was utterly out of her reckoning on all points. I maintained a silence, listening to her account of my past, present, and future, informing her that I had not come to say anything, but to listen to her revelations. When a "patient" begins to talk and to answer questions skilfully put, he really tells the palmist what he wants to know. He reveals his own character, and chance does the rest.

Some of the pretentions of palmists are notorious in respect to their audacity. One statement was to the effect that the hand and its lines are directly modified by the action of the brain. We might as legitimately hold that the big toe is so acted upon, or that the ear might afford a guide to the future of the subject. One might be more lenient to the idea that the face might prove "a dial of the mind," because it is the vehicle whereby the expressions of the emotions are largely displayed. We may be prepared to admit that the exercise of the facial muscles in particular directions might induce a spe-

cial contour of the face, and thereby stamp it with the impress of prevailing mental phases. But the case of the hand is altogether without support. The lines on the hand indicate the furrows or folds which result from muscular action, and that is all, just as we see "bracelets" at the wrist when we flex our hand on the forearm.

To assume that in some mysterious fashion or other the indications, not of character merely, but of a person's past and future, are to be determined by a survey of certain lines on the palm, is to assert a doctrine which is monstrous in respect to its absurdity. Such a statement is easily made, but when one calls for proof he does not find it in the results of the palmist's practice, and certainly no explanation is forthcoming from the side of physiology. Your Gypsy woman who for half a crown will predict your future, is quite on a par with the lady who, in a dimly lit oriental apartment in London, charges her guinea. The whole soothsaying business is a matter of tricks, such as can impress the credulous alone. I never heard the case against palmistry and fortune-telling at large better summed up than in the expression of an American critic. He declared that if there was any truth or reality in the art, the palmist could make his fortune on the turf by backing winners, that his operations on the stock exchange would soon render him independent, and that if a life insurance company could trust to his revelations regarding the duration of life of insurers, he would be retained by it at the salary of a prime minister.

That which also surprises me is the faith which cultured people occasionally are found to place in crystal-gazing. I have read of cases in which it was averred that a lady looking into a crystal described to bystanders scenes she had never witnessed, but with which scenes they were themselves familiar. Now, one would wish here for much more exact evidence than mere hearsay. In a scientific investigation we should have all the evidence duly noted, and every possibility of fraud or error avoided. There would require to be an exact inquiry into all the circumstances under which the alleged reproductions in the crystal, construed by the brain of a person unfamiliar with the scenes, were carried out. I do not know if in a single instance this plan was pursued. Why should we not apply the care we exercise in ordinary matters of life to the pretensions of the crystal-gazer? Besides, even on scientific grounds we might find in certain brain-vagaries materials for accounting for the phenomena on the lines of unconscious memory and reproduction of impressions. As for the palmists, let us devoutly hope we have heard the last of them. On this point I have my doubts.

HAVE WE HAD PRE-EXISTENCE?

When we look at the differentiations, which we call the natural characters of men, we find that they have a very great resemblance to those differentiations which we learn by direct experience can be produced in the course of a single life. One man seems to start with an impotence to resist some particular temptation which exactly resembles the impotence which has been produced in another man by con-

tinual yielding to the same temptation. One man, again, has through life a calm and serene virtue which another gains only by years of strenuous effort. Others again have instinctive powers of judging nice and difficult questions of quality, in pictures, for example, or in wine, which place them, soon after they have turned their attention to the subject, in a position to which less fortunate men can attain, if at all, only by the experience of years. Here, then, we have characteristics which are born with us, which are not acquired in our present lives, and which are strikingly like characteristics which, in other cases, we know to be due to the condensed results of experience. Is it not probable that the innate characteristics are also due to the condensed results of experience—in this case, of experience in an earlier life?

PHENOMENA FROM GHOST-LAND.

Recent study of ghosts by the Society for Psychical Research has led to some startling conclusions. The subject, of course, is not one in which results obtained from experiments can be accepted as exact and beyond possibility of error, but out of the best authenticated facts, carefully sifted for truth has been drawn a new theory, namely, that a spectre, or apparition of a human being not in the flesh, has only two dimensions, length and breadth, with no appreciable thickness.

It will be shown presently how this theory—if it be accepted as correct—accounts satisfactorily for some phantasmal phenomena hitherto deemed inexplicable—such, for example, as the sudden appearance or vanishing of a ghost. But, first, it is desirable to explain that the Society for Psychical Research, which has given many years of study to the subject, does not entertain any belief in the conventional wraith—the thing of sheeted horror which enters at the stroke of midnight, smelling of the grave, and dragging a clanking chain through a sliding panel just by the blood stain on the floor.

THEY ARE HARMLESS.

The real phantom, say the experts, is something quite different, wholly harmless, and in aspect more like a magic-lantern picture than anything else to which it can be readily compared. The conventional ghost is essentially supernatural; the real ghost is a natural phenomenon which as yet is not understood. Most stories of phantoms are pure nonsense, built out of the imagination; but here and there has been found one that bore investigation, and which has been supported by such evidence as to satisfy the society of its accuracy. Enough authentic apparitions have been sifted out, in short, to come mighty near to proving that ghosts do exist. If so much be admitted, it remains to be determined what sort of stuff, if any, they are made of.

We are so accustomed to living in a world of three dimensions, where all things possess substance, whether solid, liquid or gaseous, that it is hardly possible to conceive of anything having existence with only length and breadth and without thickness. Yet it is now asserted that true ghosts exactly correspond to this

An Impressive Contrast: Arrival of a train at Mukden with new troops from Moscow and of another from the battlefield with the wounded.

description. They are the mysterious inhabitants of a region, which, for want of a better name, may be called "flat land"—a country in which the people resemble shadows thrown upon the wall, inasmuch as they have no solidity, and are invisible when turned edgewise toward the observer.

TOO THIN TO BE SEEN.

This, according to the new theory, is exactly why phantoms have such a way of appearing and disappearing suddenly. When the light does not happen to be reflected directly from the plane surface of a spectre, to the eye of the observer the ghost is necessarily invisible. It needs only to turn itself at a slight angle and instantly it seems to vanish, though from another point of view it might still be obvious and palpable.

There are now, approximately, a billion and a half of human beings alive in the world. Fully one hundred billions have lived and died. Hence it is no mere figure of speech when we say that a person newly defunct has "gone to join the majority." It is indeed a majority so great that those who now survive are relatively an insignificant few. The spiritists believe that all of the hundred billions "gone before" are still represented on the earth by ghosts. It is an idea stimulating to the imagination, and, if correct, must signify that ours is in very truth a spiritual realm, in which creatures of flesh and blood are, comparatively speaking, of small importance numerically.

Supposing such to be the case, the world must be swarming with spectres, and we are obliged to imagine a viewless air as literally thronged with phantasmal shapes, preserving the likeness of what they once were in the flesh, but without substance, and even transparent to the eye, when beheld under suitable conditions. The marvel is not that they should occasionally present themselves to living beings as apparitions, but that they should be seen so seldom. Perhaps, however, they are controlled by circumstances which by us are unknowable.

SOME SPECULATIONS.

Shall you ever be a ghost? And if so, are you likely to find such a situation agreeable? One would suppose not, but it is impossible to tell. It may be that phantoms enjoy a kind of happiness of their own, though witnesses have usually described their aspect as melancholy, and, having no bodies, they are necessarily free from the varied physical ills to which human flesh is heir. They cannot suffer from heat or cold, and it is reasonable to imagine that they are not subject to the law of gravitation. Transportation to any distance should be to them a matter of an instant.

Speculations in regard to existence beyond the grave possess an absorbing and never-failing human interest. We must get there some time, if we survive the tomb, and we are naturally anxious to obtain an inkling as to what is going to become of us. If it be true, as above suggested, that the ghosts of the dead possess no substance whatever, but merely length and breadth, we need not dread crowding in the hereafter, inasmuch as 20,000 spectres would occupy no more room, in effect, than a dozen. They could be as-

sembled in a pack and shuffled like the thinnest of playing cards.

It is not astonishing, when the demand for knowledge on this subject is considered, that many persons should make a good living by conjuring up spooks for the entertainment of the credulous. For the moderate charge of $1 or $2, paid to a "medium," anybody may see one ghost or several. Or—and this is the latest improvement—one may develop actual photographs of phantoms in one's own dark room. The special dry plates, bought from a medium, are guaranteed to "fetch" the spectre, which, in this shape, are to be regarded as the most reliable of all supernatural phenomena.

"GHOST PLATES" IN DEMAND.

"Ghost plates" are manufactured on a large scale in Boston, whence they are shipped all over the country. Many mediums, however, prefer to make their own. They cost $10 to $15 a dozen, and may be used like any other dry plates. If you take photographs of people on them you will find that phantasmal heads and various other strange things appear in the developed negatives. They are most remarkable, and it is not surprising that, even at so high a price, there should be a steady demand for them from Maine to California, and from Chicago to Florida.

As a matter of fact, the plates, before being sold, are "exposed" ones. That is to say, pictures are taken with them—usually of historical portraits or classical heads, which have been cut out of the paper on which they are printed and attached to a black cloth. Under-exposures are purposely made, so that, when ordinary photographs are taken on the plates, and the latter are developed, the "phantoms" come out faint and ghost-like.

The human intelligence has greatly expanded during the last few centuries, and education has done wonders for the mind, but people today are just as fond of being humbugged as they were 3,000 or 5,000 years ago. Where things supernatural are concerned they are so eager to be deceived that the "mediums" do not have to go after gudgeons, but are actually pursued by them. Meanwhile, the real ghost, which cannot be persuaded to appear to order, is without an advertising agent, and up to now has eluded proper investigation. Perhaps it will be better understood at a future day.

THE FAKES AND FAKERS OF SPIRITUALISM.

Dr. Isaac K. Funk, whose disclosures regarding Spiritualism have created intense interest, is one of the most learned men in the country. Besides being a prominent Prohibitionist, he is editor of the Standard Dictionary and head of the big New York publishing house of Funk & Wagnalls.

The first intimation that he believed in Spiritualism reached the public through a story relating his experience at a seance in Brooklyn in February, 1903.

It was at one of these "sittings" that Dr. Funk says he communicated with what he supposed was the spirit of Henry Ward Beecher. The remarkable story of

"The Widow's Mite" was the result of the communication.

Now Dr. Funk has created more surprise by exposing the workings of alleged spiritualists. But at the time he set out to discover all that was behind the phenomena, he took more than passing interest in the subject.

So it would appear from this statement that Dr. Funk has been interested in the subject of Spiritualism for a number of years.

A QUEER CASE.

It was in February of 1903 that his belief in the phenomena took a definite form. In that month he heard of a woman in Brooklyn who gave Spiritualistic "sittings" at her home every Wednesday night. Knowing that it was strictly a family affair, Dr. Funk figured that if he could get permission to attend one of these seances it would afford him a splendid opportunity to investigate.

At 11 o'clock on one of those nights the control named Geiige asked:

"Has any one here got anything that belonged to Mr. Beecher?"

Dr. Funk spoke up, saying he had a letter from Dr. Hillis, Mr. Beecher's successor.

"I am told by a spirit present that Mr. Beecher, who is not present, is concerned about a coin, 'the widow's mite.' This coin is out of its place and should be returned," continued the control. "Mr. Beecher looks to you, doctor, to return it."

Dr. Funk thought for a few seconds. Finally he remembered that when he was making the Standard Dictionary nine years before he had borrowed an old coin, called "the widow's mite," from a man in Brooklyn. The gentleman was a close friend of Mr. Beecher.

Dr. Funk was further informed by the control that the coin in question was in a vault under a lot of papers. He had always supposed that it had been returned. Later on he made inquiries at the office concerning it. Everybody who had knowledge of the coin reported that it had been returned. But Dr. Funk believed that what the spirit of Henry Ward Beecher told him was true. The story of how the piece of money was finally located under a pile of paper in the safe of the publishing office has been often repeated. It was then that Dr. Funk's faith in Spiritualism broadened. He continued his research until he recently made the startling discovery that paraphernalia with which "sittings" are conducted can be purchased very reasonably in Chicago.

AN INVESTIGATION.

A noted writer determined to make a thorough investigation of this market of Spiritualistic fakes. The experience that ensued is related as follows:

"When I entered the Spiritualistic workshop with the intention of learning the entire truth about Spiritualism, I, in common with most of the rest of the world, had a lurking belief that there might be something in Spiritualism; that there might, perhaps, exist in some one the power to materialize a spirit into flesh.

"When I left the shop I had had stripped from me every atom of belief. I had seen one brand of Spiritualism exposed as one of the greatest frauds of the

A Japanese Patrolling Party "spying out the land" in advance of their troops. Their success is largely to be attributed to their cautiousness and preparation.

century. I had ringing in my ears the cynical words of the clever little manufacturer of materialized spirits:

"'By the way, when you go out as a medium, if you ever see any real spirits materialize, just come and tell me about it, will you?'

DOORS SHUT, WINDOWS DARK.

"'Remember that I am not a medium.' Mr. Meyers said, as he locked the door and saw that the windows were all carefully shrouded from chance curious eyes outside.

"This is his custom always. Prospective customers must make a $10 deposit before they witness any materializations, and they are admitted to the shop singly or in couples only, and the door is always locked behind them.

VIEWS A SEANCE.

"'I cannot give you as realistic a seance here as a medium could in a room properly fitted up for the work. The walls of a room in which a seance is given should be lined with dead black, and for the so-called "light" seances the lights should be as carefully adjusted as those of a theatre."

"Then he extinguished the light and withdrew into a little room, before the door of which there hung a curtain. In a moment his voice was heard from behind the drapery.

"'There, there,' it said, soothingly, softly, as one would speak to a child, 'go on out of the cabinet. Don't be afraid. Go and speak to the lady.'

"Then there appeared on the floor, directly in front of me, a small spot of phosphorescent light that wavered and grew larger and rose higher in the air with every second. Then my eyes distinguished floating draperies, and next the slender, drooping figure and the calm, sweet face of a young girl.

"The girl advanced slowly toward me. Even though I knew I was witnessing but the clever trick of a clever charlatan, I felt my blood grow cold as the figure advanced slowly toward me and laid a clammy, cold hand on my forehead.

LIGHT PIERCES DISGUISE.

"But just then the light from a passing street car pierced even the thick curtains of the window, and I saw beneath the gauzy robes the very prosaic business suit of Mr. Meyers and heard his laugh of amusement as he backed slowly away and then sank in a swirl of gauze to the floor and disappeared.

"It was funny, I give you my word—that patent exposure of the Spiritualistic mediums in the trick with which they have fooled thousands—even though the shock was a bit startling after the eeriness of the 'ghost' scene.

"'Do you see how it is done?' he said from the cabinet.

"'The most of it,' I returned. 'I do not see, however, just how you keep from being seen while coming from the door of the cabinet to the centre of the room.'

"'That's simply my coat,' he returned, with a laugh. 'I gather all this drapery up about me with one hand and hold my coat (the mediums use black cloth) over my face and the upper part of my body. You cannot see black against black, and when I reach the centre of the room I simply simultaneously drop the coat and let fall the draperies.'

TRICK OF ARMS AND LEGS.

"'But the figure appeared so small at first,' I said.

"'That is only a trick of kneeling and posturing,' he replied. 'When I let the coat fall I am prostrate on the floor with only my uplifted and masked face showing. Then I slowly rise to my knees, and then to my feet. The gliding motion is a trick of arms and legs that every actor knows.'

"'Was it your hand that touched my forehead?' I queried, determined to know the whole of the ghostly business.

"'No,' he said; 'it was a hand covering mine—a hand made of rubber, the same material of which the mask is composed.'

"Then, with a quick transition back to the faker, he spoke softly again to something invisible.

"'What's the matter, Fritzie?' he said.

"Scratch! scratch! tap! tap! came a sound, as of little fingers groping with the door catch.

"'What's the matter, Fritzie?' repeated the soft, soothing voice.

"'Fritzie wants to get out. Fritzie wants to see mamma,' piped a childish treble that would tear into quivering shreds the heart-strings of a mother bereaved and ready to believe anything that would bring back to her even for an instant any semblance of her lost darling.

LITTLE CHILD APPEARS.

"Then, floating in the air above our heads, I saw a little childish face, so lifelike, so full of the unearthly beauty that one associates with the babies we have sent on before, that in a flash I comprehended how lonely, broken-hearted mothers spend fortunes upon the tricksters who in this manner prey upon their credulity.

"It was still the mask, with the man's figure hidden in the concealing black.

"'That head is fastened to a slender rod that bends and waves or sweeps in circles as my arm directs,' the pseudo-medium explained.

"'But I didn't see even your hand,' I objected, 'or your face, either.'

"'Of course not,' he returned. 'I had on a black mask and black gloves.'

"Many other figures came from behind the curtain, while the wonderful voice of the ventriloquist who manipulated them questioned them in tones of a master and answered in every conceivable intonation, from the deep, grave basso of the husband and father to the tiny pipe of the child.

"Stately Catholic priests with crucifixes uplifted and rosaries dangling from clammy fingers blessed me so realistically that I almost sank to my knees in reverence; sweet-faced sisters of charity glided past me and whispered soft words in my ears; grim, forbidding Indian chiefs, graceful Indian maidens, stately kings and queens in glittering crowns and gorgeous robes of state; tottering, aged men and women.

PRICES FOR VARIOUS OUTFITS.

"The whole procession swept along before me, underneath each one of them the dapper, sauve little man whose deft fingers make it possible for hundreds of mediums to coin fortunes from the heart-throbs of the credulous.

"The charlatan turned up the lights,

picked up his coat from the floor and became again the shrewd business man.

"'I can fit you out as a medium for $100,' he said, 'if you do not take the elaborate mechanical figures.'

"'What about the slate writing?' I queried. 'Is it a mechanical trick?'

SLATE TRICK THE SIMPLEST.

"'Slate writing is simply cussed brass,' frankly returned Mr. Meyers. 'For $5 I can fit you out with slates that you can glue together with the pencil inside, hang upon the chandelier in full view of the audience, and in a few moments take them down with a message written inside. There are different kinds of slates, each with a different trick. I only teach a trick after I have sold and delivered that particular slate. It is the simplest of all tricks, however.

"'Many of my patrons make more than $100 on a Sunday seance. They never recommend me to any one, however, as they are a jealous set and try to keep the field to themselves. A real medium never admits that there is nothing in Spiritualism. Even to me she carries out the pretense by saying that she has lost her "power" and has to substitute bogus goods for the real, materialized spirits.

"'Some of the most prominent mediums have amassed fortunes. I rarely know their real names and addresses, as most of them purchase through agents.'

"'And this is spiritualism,' I said, half to myself, as I rose to go.

"'Yes,' said the clever little medium maker, 'this is spiritualism—all there is of it.'

EASY GRAFT OF THE MEDIUMS.

"Most people suppose that mediums all profess to summon up real ghosts—that, in the language of the profession, they materialize. That isn't true. To one materializing medium in these days there are a hundred test mediums.

"The test medium holds forth usually in a cheap hall. The admission is low, for her patrons are poor. Usually it runs from 10 to 25 cents.

"She starts off with a hymn. Then she borrows an article from each person in the congregation and begins her tests.

"For example, she'll hold up a glove and ask who owns it. When the owner has spoken up she'll hold the glove to her forehead and say something like this:

"'I hear the name John. Have you a John in the spirit world?'

"If the owner of the glove has a John among the departed the medium sends some beautiful communications and then tries to draw the victim out. With a cleverness born of experience, she pieces together his occupation, his troubles and his wants, and tells him all about them.

"He's paralyzed with astonishment, and so are the rest of the circle—for the people who go to seances aren't critical, and they go with a great desire to believe.

TEST MEDIUMS TESTED.

"One of the hardest things for a test medium to do is to call at once the name of the dear departed in the spirit realm. If she starts off with John, and runs through Mary and Katherine and Lily, and none of them hit the mark, then the most credulous seeker after spirits is in-

Human ladder of Japanese escalading a fort at Port Arthur.

clined to pronounce her a fake. On the other hand, if she hits at once the name of the very spirit which the seeker most desires, she's pronounced a great success.

"Their best means of getting at names is a sort of Mediums' Union, an unorganized society for mutual help which exists in every medium ridden town.

"Mme. Fake, the medium, has a new visitor, a fat woman in black, we'll say, who wears her front hair in gray frizzes and has a slight limp. Mme. Fake tries out a half a dozen names on her. Perhaps she gets down to the sixth before she finds that Robert fits some dead relative of the old lady in black.

"Before Mrs. Fake gets through, she's learned further that the old lady has a dead sister named Annie. The old lady, remembering how long Mme. Fake has been in getting those names, goes away declaring that she's no good.

"Mrs. Fake knows all that, and knows that the old lady won't come to her again, but that she'll surely go to another medium—for when a person is bitten by the spiritualistic bug he usually keeps going to mediums until he gets satisfaction.

"So Mrs. Fake notifies every medium in her crowd, giving a close description of the old lady, together with the names of her spirit friends and any other accurate information which she has been able to drag out. Next Sunday night, when an old lady in black, with frizzes and a limp shows up at the Home of Truth Circle, conducted by Mrs. Soakem, the second sight wonder, the old lady is told right off the bat that Robert wants her and a beautiful spirit named Anne is over her shoulder calling her sister.

REMARKABLE PROOF.

"She goes away firmly convinced that Mrs. Soakem is a wonder and that immortality is proved. In a western city I've seen printed blanks used to distribute such information among mediums.

"That isn't their only method of getting names, though. Some of them are very clever lip-readers. When in doubt they play 'William' or 'John,' those being the most common Anglo-Saxon names.

"Then they make it a point to learn the names of people living in the neighborhood and to watch the obituary notices, knowing that half their victims are driven to them by the ache of some recent bereavement.

"That's the nasty part of the whole business. The laboring men's wives and daughters, the hired girls and stable boys, who haunt cheap seances, come because they're in trouble and want some help and consolation. These people put their hearts on their sleeves and tell about their love affairs and family difficulties in a way that makes you gasp. I blush sometimes to listen to them.

"The cheap test seance isn't the place where the mediums make their money, though. It is really only an advertisement to get custom for the 'private' and developing seances. All the time she is sending communications to her audiences, she is sizing them up. If one looks more easy or eager than the rest, she says something like this:

" 'John tells me that the spirits have much to tell you, but you're holding back. You need to draw closer to 'em.'

That suggestion is thrown out once or twice. About the third time this particular victim visits the seance the spirits say:

" 'We have something to tell you that can't be told in public. You must see a medium alone.'

"If the victim is a woman—and she usually is—curiosity brings her around the very next day. The private sittings cost from 50 cents an hour up, according to the means and credulity of the victims. The medium loses no chance of leading her on to come again.

PSYCHICS.

"Developing sittings are a beautiful graft. The medium uses this dodge on people who have what they call the psychic temperament—they can pick them a mile away.

"These people are usually hankering to be mediums and to talk to the spirits themselves. The medium leads them on, says that they have psychic powers and the spirits want to come into close communion with them. It all leads up to the private developing seance, which costs all the victims can pay and lasts as long as they'll stand for it.

"This is their common or garden variety of graft. But they work all kinds of variations. There's a medium in Boston who has cleaned up a pile by 'discovering' lost treasures. Locating mines is a favorite variety in the far west.

"There is a medium in San Francisco, Mme. Smith we'll call her, who's a wonder in her way. The Pacific Mail liner Rio de Janeiro was sunk in the Golden Gate on Washington's birthday, 1901, with $60,000 in gold aboard. No one could find the hull.

"After the steamship and wrecking companies had tried and failed, Mme. Smith had a revelation from the captain of the Rio, which showed her the exact spot where the hull lay in shallow water. Mme. Smith had this revelation one evening in a full circle. She said that it wouldn't do for her to take all that money; she'd lose her power if she did. But she was going to let in all her dear friends and believers—for a consideration.

"According to a faker who stood in with her then, but fell out with her later, she sold $25,000 worth of stock in her wrecking company. They made a few bluffs at diving and then announced that Mme. Smith had been guided wrong by an evil spirit, and that the expenses of diving had eaten up the capital.

"But Mme. Smith would make it all right. She'd give, in return for wrecking company stock, shares in an oil company which was to make a fortune from wells discovered by her psychic powers. They took it like lambs, and she's doing business at the same old stand.

"Materializing or bringing ghosts out of the vasty deep doesn't pay so well. It is a kind of public show, with very little side graft. Therefore it is less common, and admission is higher, usually a dollar a head.

"I've seen dozens of developing seances, and in every case the method was the same. The cabinet is hung with black and covered in front with a black curtain. The surrounding wall is also draped in black.

"Often the cabinet is the bow window of a house or hall. The audience is asked to inspect the walls and curtains. They may inspect all they like. The trick isn't there.

"There is a dim, shaded point of light

in the back of the room, practically no light at all. When all is ready the medium takes a seat near the curtain and calls for a hymn.

HOW IT IS DONE.

"While it is being sung his assistant—usually a woman—steals into the room by a side door near the cabinet. She's dressed in a dead black robe, and against the black background of the walls and cabinet she can't be seen at all in that light, no matter how much she moves. She wears rubber-soled shoes and the hymn helps her to enter without being heard.

"Under the black robe she is dressed in ghostly white, and often she wears a mask lightly coated with phosphorescent paint to make a shining spirit face.

"When the signal is given to appear she opens the black robe in front, and when she disappears she simply closes it again. By closing it a certain way she produces the effect of disappearing through the floor. There are often two or three assistants, one a child or a small woman.

"The developing medium, like the test medium, keeps tabs on the departed dear ones of his regular customers, and trots them out for their benefit. It makes you ashamed of humanity to see the way these fakers draw back bereaved mothers who live from week to week just to talk to their dead children.

"There are many other methods of materializing, but this one is the cheapest and most satisfactory, and has supplanted all the others."

LUMINOUS SLEEP.

A little pamphlet has lately been published by a native of Ceylon, entitled "Luminous Sleep," by P. Arunáchalam, M. A. The writer treats of sleep entirely from the psychological, and not at all from the physical point of view. There are, he maintains, three kinds of sleep, the third of which is little known in Europe. First, there is dreaming sleep, "when the curtain falls on this act to rise on another far more interesting, an inner world full of intense life and emotion." Secondly, he speaks of a strange, unexplored land, the region of deep sleep. "In this sleep we are unconscious of our existence, but on waking we are sure that we have been in a blissful haven of rest, and we say, 'I have slept well.'" But he maintains there is yet another sleep, a "sleep of light," in which, while there is absence of thought, while there is rest and bliss, there is not darkness and oblivion, but perfect consciousness.

TENNYSON AS AN EXAMPLE.

In the east, Mr. Arunáchalam tells us, there are men who know how to "lift the veil of sleep" and who refresh their spirits in this "sleep of light" in a manner otherwise impossible, and appear to obtain from it some conviction of immortality. This occult power is, he asserts, not unknown in the west; but it is not, he laments, widely cultivated. In illustration of his meaning he quotes a passage from the "Life of Tennyson," which we give in full: "I have never had any revelation through anesthetics, but a kind of waking trance (this for lack of a better name) I have frequently had quite up from boy-

Horrors of War: Deadly wire entanglements through which the Japanese fought their way to victory at Nan-Shan.

hood, when I have been all alone. This had often come upon me through repeating my own name to myself silently till all at once, as it were out of intensity of the consciousness of individuality, the individuality itself seemed to dissolve and fade into boundless being; and this not a confused state, but the clearest of the clearest, the surest of the surest; utterly beyond words, where death was an almost laughable impossibility, the loss of personality (if so it were) seeming no extinction, but the only true life. I am ashamed of my feeble description. Have I not said that the state is utterly beyond words?" "If the science of the spirit," comments the writer of the pamphlet, "were cultivated in Europe as it is in India, and if practical instruction and guidance had been available to Tennyson, what heights might not so ripe a soul have scaled, what blessed vistas might he not have opened up to the west!"

CAN WE LEARN DURING SLEEP?

There is a certain fascination about this suggestion. Might we really learn something during sleep if we tried? If sleep were a new phenomenon, if hitherto man had lived his life without intermission of consciousness, and if suddenly he discovered in some corner of the globe a race who passed a third of their time in apparently unconscious repose, yet declared that during these periods of unconsciousness they passed through scenes and experienced adventures like, yet unlike, those of waking life, we should, if we could bring ourselves to believe them, imagine ourselves in a fair way to discover the secret of death. The personality of the healthy dreamer is free of the body: in dreams he goes away from the place where it lies. His soul is not any more in his bed than the soul of a dead man is in the churchyard.

REVIVAL OF BELIEF IN WITCHCRAFT.

It is a startling reminder of our nearness to the past to read in the newspapers that a college professor is seriously arguing that witchcraft is not an exploded myth, but an alarmingly increasing reality.

Professor Herbert L. Stetson of Kalamazoo College says that "many persons are ruled by personalities other than their own," and that "it is impossible for these victims to disenthrall themselves. They grow away from their own selves by sheer force of sinister and occult influences over which they have no control. This kind of witchcraft has reached dangerous proportions, and it is one of the most important problems with which science has to deal today. These 'possessions' of demons will never cease until mankind comes to perfect conditions."

As Lecky, in his "History of European Morals," says:

"The reality of witch miracles was established by a critical tribunal, which, however imperfect, was at least the most searching then existing in the world, by the judicial decisions of the law courts of every European country, supported by the unanimous voice of public opinion, and corroborated by the investigation of some of the ablest men during several centuries."

In spite of judicial decisions, popular belief and expert opinion, faith in witchcraft became absurd through the mere growth of intelligence. Nobody "crusaded" against the superstition; it simply died out because it was repugnant to common sense and scientific reasoning.

Once in a while an echo of the terror of the past sets the world to smiling, but ordinarily it is some poor, ignorant, backwoods old woman who raises the grisly spectre of sorcery.

Witchcraft would have no chance in the world nowadays. It would hardly have time to manifest itself before the bacillus of possession was isolated, and not only would there be an anti-witch serum for sale in the drug stores, but the sources of contagion would be attacked with germicides and disinfectants. A world that has conquered cholera and yellow fever and smallpox would make short work of sorcery.

The possession that is the problem nowadays is not the possession of men's bodies by infernal spirits, but the possession of the sources of supply of the things men need.

A PECULIAR RELIGIOUS COMMUNITY.

The Koreshan Unity, a queer religious sect, who believe that the earth is a hollow globe, that we reside in it, and that the sky in some way is the shell of the globe, are taking steps to incorporate the new city of Jerusalem, which is to be located on the banks of the beautiful Estero bay, in Lee county, Florida, which they say will soon be famed as the waters upon which, when the work is completed, will arise one of the greatest cities of the continent.

The Koreshan Unity has posted legal notices in the Estero post-office that a meeting of the citizens will be held for the purpose of arranging to incorporate a city to contain twelve miles square territory, and erect buildings, etc.

ROOM FOR 10,000,000 PERSONS.

To give ample room for the 10,000,000 of population which they hope to gather there in time, 4,000 acres of land in Lee county have been taken in, running down to Estero bay and back into the wild lands for miles.

It is understood that the Koreshan Unity will purchase all the lands of the United Land Company embraced in the proposed corporate limits.

The New Jerusalem is to be laid out, on paper at least, on a scale which will dwarf into insignificance all plans of present large cities.

There will be great temples, from which broad avenues will radiate in every direction, and the picturesque Estero bay and river will play an important part in the future of the new city.

The owners of the groves of grapefruit and oranges that are now planted on Estero creek will find at their own doors a market to utilize the crops grown, and eventually New Jerusalem is to become the leading seaport of the world.

HIGH PRIEST OF ORDER.

Dr. Teed, the high priest of the Koreshan Unity at Estero, was in Jacksonville recently on business connected with incorporating the new city. In addition

Dr. Teed has just purchased the fine tourist hotel on St. James' island, in Charlotte harbor, and his plan is to make this a huge Chautauqua university, with hotel accommodation at popular prices for thousands of guests. Each season he will present new Chautauqua features.

At Estero there is already a large shipbuilding plant, which is very prosperous, a factory for the manufacture of shawls, and other manufacturing concerns which employ a great number of men.

The new colony is run on the co-operative plan. Each member is given a certain piece of work to do, and he is paid out of the treasury of the colony. No member is to own more than the other.

GODS AND DEVILS OF MANY LANDS.

One has only to reflect that the false gods of Hindustan number upward of two hundred millions in order to realize the stupendous difficulty in the way of Christian missionaries in India. Workers in the foreign mission field have to contend first with regularly organized religions, such as Mohammedanism, Buddhism, Shintoism, Taoism, Confucianism, Brahminism, and so on. Then come sheer paganism, devil worship and all kinds of base and dreadful orgies characteristic of the darkest parts of the earth, ranging from the mysterious snake worship of Hayti and the interior of Santo Domingo away to the dreadful "sanctuaries" of the Bight of Benin, in Africa, which were slippery with human blood and paved with the skulls of human victims offered up in propitiation to evil spirits.

As is well known, the cow is the most sacred animal of the Hindus, but that does not prevent even the holy city of Benares having a temple dedicated to sacred monkeys or the worship of the elephant-headed Ganesha as a god.

At "melas," or fairs, in India fakers or holy men may be seen such as make the missionary's heart ache that such obvious sincerity and terrible voluntary suffering should be so misplaced. Perhaps underneath a banyan tree one wretched man has dug a hole in the ground and buried his head and throat to the shoulders, his legs sticking up in the air like some new and remarkable branching tree.

STRANGE PRACTICES.

The missionary in savage lands has all kinds of ancient superstitions and strange practices to contend with—practices implicitly believed in by the people through generations and centuries and even thousands of years. These may range from the totem poles of Alaska to the painted eyes of a Chinese junk, which eyes are supposed to enable the vessel to find its way in the dark and avoid shoals and rocks!

By the way, it is not generally known that above one of the main gates at Pekin city, the metropolis of the Chinese Empire, there are fearsome cannons painted upon canvas to frighten away possible rioters as well as evil-disposed people who might attempt to loot the city.

The great Indian "melas," or fairs, mentioned elsewhere, are a terrible hindrance to the godly work, as such immense

gatherings of fanatics seem to stir one another up to resistance, and even to a dangerous pitch of enthusiasm—as in the Juggernaut festivals of South India and

Cossacks and Japanese cavalry in battle during a thunderstorm at Wa-Fang-Kau.

the greatest of the "melas," such as is held at Thanesur, in Lodiana.

VAST NUMBERS OF PILGRIMS.

At this last named place it sometimes happens that from six hundred thousand to one million pilgrims bathe in the sacred tank at one time in order to have their sins washed away. Alas! the only visible result of this annual bath is filth, disease and death, conditions which sometimes almost reduce to despair the scores of missionary societies at work in India.

In China the missionary is saddened by the sight of a great number of wayside shrines or sacred trees. There is one, for

example, near the city of Ichang which has been worshipped for years as a tree inhabited by a divinity who must be conciliated as being likely to confer many favors.

In every Chinese house the ancestral tablets will be seen, from twelve to fifteen inches high, with the names of departed ancestors carved upon them. Every day incense is burned before them, as well as money and paper clothing for the use of the dead. In the great town of Shao-Hing, the centre of the extensive wine industry, there is a regular traffic carried on in the making of "tinfoil spirit money," such as may be burned and thus sent to another world for the convenience of departed ancestors.

DEVIL TREES.

Apropos of Corea, these people, too, have their wayside tree shrines, and a unique photograph of a devil tree in Corea has been caught by the camera. These people believe that a devil has taken up his residence in this part of the road, and so every traveler who passes either throws a stone at the roots of the tree or else hangs a rag on one of its branches to divert the attention of the devil or else to propitiate him should he be in a bad humor. And it may be well to remark that no ordinary Corean is ever at a loss to find a rag on his person.

In Burmah and Siam the temples on feast days are wonderful sights of color owing to the lovely silks worn by men and women alike, and in Burmese towns like Bhamo one may often see the most fantastic processions, carrying colossal dragons looped upon poles through the streets.

In west Africa the missionary has to contend with the witch doctor and devil dancer, who exercise most potent influence over the benighted heathen. These devil dancers usually wear weird and fantastic masks and strange, uncouth coats of hair and wool.

It is a sight nothing short of terrible to see twenty or thirty of these fiendish looking creatures dancing about in a clearing surrounded by "wattle and daub" huts, when late at night the fires throw flickering flames upon their horrible masks and the murderous looking knives of sacrifice which they hold in their hands.

Human sacrifice, by the way, is still practiced in many parts of Central and West Central Africa, and also in New Guinea, Borneo and many of the islands of the south seas. This dreadful custom may be due either to the suggestion of a native priest or merely to a desire to collect numbers of heads as trophies.

TELEPATHY.

OPINIONS OF GOLDWIN SMITH, THE GREAT CANADIAN SCHOLAR.

There has appeared an account by Mr. Rider Haggard of a telepathic communication between him and his favorite dog which he evidently considered of great importance. It seems he had a nightmare in which he dreamed that his dog was being killed and cried to him for help. It turned out that the dog had been killed about that hour. It does not seem that

the coincidence of time was exact, while as to the manner of the dog's death the dream gave no sign, or none that could be deemed a coincidence. The narrative, I confess, seemed to me less important as a proof of mysterious agency than as a proof of the extent to which fancy can operate on very slight materials, even in a strong mind. Mr. Haggard designates his dream as a nightmare; the cause of nightmare is indigestion; and it is difficult to believe that indigestion is a factor in the operations of the spirit world.

All the cases of telepathy of which I have read have seemed to me to resolve themselves either into fulfillments of natural expectations, as in the case of warnings that a person known to be sick is dead, or into accidental coincidences, of which in the chapter of accidents there are sure to be many, some of them curious and striking, the occurrence being afterward dressed up by the retroactive imagination of which we are all apt to be the unconscious dupes. It has been remarked that there has often been a letter in the case and that the letters have not been produced.

A SPECIAL INSTANCE.

I may mention an instance of accidental coincidence which fell within my own knowledge. A person living at Oxford was staying at a house at some distance from that city. Crossing a heath, he was attacked by faintness and lay for some time prostrate on the heath. When he got back to the house in which he was staying he found that at the very moment when he was lying on the heath a telegram had been received from his servant at Oxford asking whether it was true that he had died suddenly. Another person of the same name had died suddenly. This was the explanation. Had the fainting fit ended differently, here would have been a telepathic warning, and if not with a letter, with a telegram as its proof.

As to spiritualism, one can only wonder that the imposture should have survived such a series of exposures. It in fact exposes itself, since the spirits must materialize before we can be made sensible of their presence. The planchette has produced nothing but absurdities. Such a mode of communication adopted by spirits is a flagrant absurdity in itself. The delusion is probably kept alive by the craving for intercourse with the lost objects of affection. I believe I once told you my own experience. The premier medium of the day, illumined by a spirit which had entered him, recounted to me the misfortunes of my nephew, when a nephew I never had. In this case I rather suspected that the spirit was trading on a hint given her by a friend who was himself misinformed. When I asked whether I was married, the answer was that I seemed to be alone in the material world and yet not alone.

INSTINCT FOR THE SUPERNATURAL.

It is needless to say that there has always been a craving for the supernatural, which has shown itself in the eclipses of religion. With the collapse of Roman religion came the mysteries of Isis; with the collapse of mediæval Catholicism came the prevalence of astrology, which captured minds so powerful in different ways as those of Wallenstein and Kepler. Such fancies as spiritualism, telepathy,

planchette, seem to be the offspring of a similar void in the soul, created by the departure of traditional religion. They will not help us to save or revive our spiritual life. They will act in the opposite way. They will seduce us into groveling superstition. There are physical mysteries still to be solved by physiology, no doubt. The creative action of the imagination in dreams is one of them, linked no doubt with the general mystery, still profound, of memory. But there is no place for the supernatural. Let us put that away forever.

SPECIAL UNCLASSIFIED RARITIES OF POPULAR INTEREST IN NOTABLE FANCY AND FACT FROM OVER THE WORLD

PORTIONS OF THE EARTH STILL UNEXPLORED.

ONLY two great prizes now await the present day explorer, the north pole and the south pole. It is interesting to note how the scene of geographical interest shifts from one region to another. Africa, Arctica, Antarctica have followed in succession. What will it be next, or will some of the old loves continue to claim our advances until full surrender?

The most prominent feature of geographical work has been the activity in Antarctic exploration. England, Germany, Sweden, Scotland, Belgium, and France have all sent ships to this region, and the result has been to wonderfuly increase our knowledge of that most interesting portion of the globe.

In the Arctic field there has been continued activity. Abruzzi, the able and energetic young Italian duke, has in a splendid and effective dash recorded the nearest approach to the pole, and has by his experience eliminated Franz Josef Land from further consideration as a polar base.

Mr. Ziegler, with commendable persistense, is pushing his attack upon the pole via Franz Josef Land, and news from his expedition may be received at any time. Amundsen is in the field laying siege to the north magnetic pole. But there remains still the pole itself, and the mystery of that 3,000,000 square miles about it, which stands as a challenge and a reproach to us.

In Asia, "the roof of the world," there have been numbers of workers. The American explorers, Pumpelly and the Workmans, have done good work. The latter have attained the highest altitude yet reached by human beings, 7,135 meters. But the magnificent work of Sven Hedin, the great Swedish traveler, far surpasses that of all other explorers in this region. In fact, this explorer undoubtedly stands foremost in energy and extent and accuracy of his work among the active explorers of the day.

Lhassa, "the forbidden city," the mystery and secret of central Asia, the unattained objective of many travelers, has been reached and reported upon by several, and today the English military expedition of Captain Younghusband occupies the city. The sacred city of the lamas is a mystery no longer. In Africa, once "the dark continent," the work of large exploration is at an end, and has been succeeded by the work of division and colonization. No longer the "dark continent," it is known in its geographic entirety better perhaps than South America.

The fine French surveys in the central Soudan, L'Enfant's determination of actual water communications between Lake Tchad and the Atlantic through the

Niger system, and young Grogan's feat, the longitudinal traverse of the continent from Cape Town to Cairo, are worthy of note. Abyssinia in Africa, like Tibet in Asia, is being traversed and studied by travelers of various nationalities, and Ethiopia is emerging toward a place among the nations of the world.

In North America, "the granary of the world," numbers of explorers have been busy, more particularly in Alaska and the northern portion of the continent. A feature, perhaps, of this region, has been the recent activity of the Canadian government in exploiting the northern lands, though more in a political than a geographical mood. In South America the main work has been that of the government boundary commissions.

In Europe, "the metropolis of the world," geographical work is now of necessity a work of detail and rigid scientific development. Of this class of work perhaps no better example can be given than that inaugurated and carried on by Sir John Murray in the Scottish lakes.

In the domain of the oceans the material obtained in connection with the surveys for the Pacific cables and the development of the Pacific "great deeps" stand prominent.

So much for the work in the field, the work which by many is regarded as only the raw material. What yet remains to be done?

The fact of my personal interest in the polar field does not affect the truth of the broad statement that there is no longer any great pioneer work of geographical discovery to be accomplished except at the apices of the earth, at the north and south poles. Here alone large areas, guarded by the sternest natural obstacles to be found upon the face of the earth, still challenge and defy conquest.

It has been the fashion during the last few years in the interest and enthusiasm excited for Antarctic work to decry further Arctic work as not likely to be of value, and to assume that in the Antarctic region alone is there a field for really valuable scientific investigation. There are no 3,000,000 square miles of the earth's surface that do not contain scientific information of value much greater than the cost of securing it.

Uninfluenced by prospects of gain, by dreams of colonization, by land lust, or politics, the centuries' long struggle of the best and bravest sons of England, Germany, Norway, Sweden, Holland, France, Russia, Italy, and the United States has made this field of effort classic, almost sacred.

The south pole, from a practical geographic point of view, is no less a prize than the north pole, but the north pole has a place in history, in literature, in sentiment, if you will, which the south pole will never hold.

There are two other geographical feats of primary magnitude yet to be accomplished by the explorer. The culminating peak of Asia remains yet to be won. The culminating point of North America remains yet untrodden by human foot.

Terrific destruction of shell filled with explosive invented by Professor Shimose. A six-inch shell filled with guncotton makes a hole through a steel target no larger than the shell itself, but this tears an opening three feet in diameter and flies into three thousand pieces.

ARE OTHER PLANETS INHABITED?

Camille Flammarion, the eminent French astronomer, declares that not only is the planet Mars inhabited, but that its inhabitants, in all probability, are more advanced in the line of progress than we are, enjoy a more enlightened and spiritual life and know a great deal more about the earth than we know about their planet.

Mars is more carefully watched by astronomers than any other planet, he says, because it is known that it is actually approaching the earth, and the geographical position of Mars is better known than that of our own globe.

M. Flammarion supports his opinion by scientific discoveries and deductions and inclines to the belief that, sooner or later, we will be able to exchange signals with the Martians. He says:

It is known that Mars is actually approaching the earth; that astronomers have their eyes upon it, and that luminous projections have been noted, of which explanation is possible, and we know, moreover, that the discovery of canallike lines in the planet has led to the question of possible inhabitants of Mars, and of the probability of a future communication with them.

It is hard to realize that the geographical position of Mars is better known than that of our own globe, but when a picture of the north or south pole of Mars is seen, it must be acknowledged that it is impossible to give the presentment of the same parts of our planet.

The polar snows are observed to brighten and grow warm under the sun, which melts them rapidly in a summer twice as long as ours, until they almost entirely disappear, leaving only a little ice upon a point which we know represents the cold pole, 340 kilometers distant from the geographical pole. None of these details are known about the same points on our own planet, and even the inhabitants of Mars may be ignorant of them if they have not been within reach of them.

YEAR TWICE AS LONG AS OURS.

We can draw all the geographical configurations, seas, coasts, islands, peninsulas, mouths of rivers or canals of Mars with accuracy; and we can anticipate what district will appear in the lens of the telescope for the length of the rotation of the planet is known to the hundredth part of a second. As the planet turns upon its axis more slowly than ours, the calendar of the inhabitants of Mars is composed of two consecutive years of 668 days and a bisextile one of 669 days.

I do not think these luminous points seen on Mars have been placed by engineers or astronomers of the world of Mars, and it would be preposterous to suppose that the sixty rectangular canals, parallel and double, which we admire upon this same planet, putting all the Martian seas in communication with each other, are the work of the inhabitants of the sphere—this is not the conclusion I wish to draw. Nevertheless, it is none the less true that if the inhabitants of Mars wished to address signals to us, this mode of proceeding would be one of the most simple, and it is even now the only one

thinkable by us. They could not have chosen a better place for their luminous beacons, although I am far from saying that it is so. But only if it were so, it is we who would not have understood.

MORE ADVANCED IN PROGRESS.

The inhabitants of Mars, being of a much more ancient origin than we are, may be more advanced in the line of progress, and enjoy a more enlightened and spiritual life. We may even admit that they are more learned than we are in the study of nature, and that they know our world better than we know theirs, and that our astronomical science is only in its infancy compared with theirs.

If, then, the people of Mars, living perhaps a highly intelligent life, did think of addressing signals to our world in the idea that our planet was also inhabited by an intellectual race, they probably concluded when they received no reply that astronomy and optics were not advanced with us, and that we had not progressed beyond mere material instincts.

It is not exaggeration to say that there is no limit to the number of forms in which life manifests itself, and this fact is an argument to those who trust that there are superior beings in the distant world. It shows that directly the primary germs exist there is a possibility of a complete development, and that nature never lacks form in proportion to the exterior conditions. Thus it is that we have the right to suppose that in Mars there may be creatures with the manifestations of animal life and in the enjoyment of intellectual faculties.

ATMOSPHERE MUCH LIKE OURS.

In Mars we can clearly recognize the subdivision of the surface into water and terra firma. Its atmosphere has properties which accord with our own; not only do we certainly find aqueous vapor there, but spectroscopic researches prove that its principal components are the same as those of the terrestrial atmosphere, and that consequently it contains oxygen and nitrogen. Sometimes lines of clouds hide the planet from our view, and sometimes they disappear, to reappear in other places.

The extent of snow and ice covering its poles varies with the seasons. Albeit the temperature of Mars must be sensibly lower than ours from its being farther from the sun, the difference is not considerable enough to be an obstacle to the stable existence of organic matter in the hot and temperate zones. The torrid zone of Mars must nearly correspond climatologically to our temperate one. We can therefore state this fact in favor of Mars as an abode suitable to life such as exists upon earth.

HOW TO GET FAT OR THIN.

The United States Government has issued a bulletin upon its investigation of food values which gives very implicit instruction upon making or reducing ones weight.

This represents the latest scientific knowledge upon that subject.

If you are too fat, you may readily dispose of the superfluous "adipose" by giving up four or five articles of diet. In-

deed, you can easily reduce your weight at the rate of half a pound to a pound a day, if you will temporarily abandon only potatoes, candy, and bread. On the other hand, if you are anxious to achieve plumpness there are suitable and corresponding means to be adopted.

REGULATE THE FUEL FOODS.

Boiled down, the system—which is no fad, but based upon the exact conclusions of science—amounts simply to a recognition of certain articles of diet as "fuel foods." Such foods (among which bread and potatoes are conspicuous) are burned, chemically, in the body to run the body machine. What is not consumed in this way is stored as fat. Hence it follows that the fuel foods should be preferred by overthin folks and studiously avoided by those who have a tendency to corpulence.

The most attractive feature of this system is that you can have as much as you want to eat. If you are anxious to get thinner you may indulge in good and appetizing food to an unlimited extent, and yet, if you obey the simple rules, you will steadily lose flesh. Indeed, the result is beautifully certain. Would you, for example, like to lose a pound and a half in the first twenty-four hours, one pound the next day, and an average of three-quarters of a pound thereafter? If so, you have only to follow these instructions:

FLESH REDUCING DIET BOUNTIFUL.

Eat meat—any kind you want and plenty of it, but only the lean part. Eat eggs, as many of them as you like. Eat all the fruit you can stuff, barring only bananas. Eat every vegetable, excepting potatoes and corn. But cut out pastry, bread, and sweets.

You see, meat fat does not go to make muscle or blood. Such of it as is not consumed as fuel is converted into fat in the body. The same is true of sugar, and of wheat, and the other cereal grains. Therefore it is that these things must be avoided if one desires a shrinkage of the belt.

Nearly all vegetables, fortunately, are mainly water, and water, of course, doesn't fatten. Beets, for example, and carrots, celery, tomatoes, cauliflower, cabbages, lettuce, cucumbers, egg plant, and turnips may be eaten to an unlimited extent—a variety surely sufficient for anybody. All fruits, except bananas, are in the same category, and for this reason a person threatened with over-plumpness may consume them in unrestricted quantities. As for meats (if lean), as well as eggs, they are muscle and blood makers, and could never contribute fat to the most corpulently inclined individual.

SWEETS AND FATS FOR THIN.

It follows that, if you wish to be fatter, you must eat freely of those things which are forbidden to the overplump—especially bread, pastry, cereal products of all kinds, potatoes, and sweets.

One great advantage of the system, as already stated, is that it does not require the person who pursues it to make a martyr of himself. Though butter is fattening, one need not give it up, inasmuch as the quantity consumed under ordinary circumstances is small. Sugar is a fat producer, but a few lumps daily in one's tea or coffee will not count.

Horrors of War: Showing the field strewn with dead after an unsuccessful charge upon a Russian position. "Where is your regiment?" said an officer to a soldier returning from the field. "I am the regiment," he replied.

Sweets of all kinds are great fat producers, and stout people are apt to be particularly fond of them. In which connection it is worth noting that the use of sugar as food, in one shape or another, has increased enormously within the last few years. At the beginning of the nineteenth century it was expensive—a luxury, indeed, almost beyond reach by the poor—but at present it is one of the cheapest articles of diet.

HOLDING OBESITY IN CHECK.

If anybody who finds himself or herself beginning to get too fat will simply give up potatoes and bread for a while, the tendency will promptly cease. To abandon the latter is a hardship—how serious one realizes only after trying it for a few days—but the benefit gained amply pays for the sacrifice. Thin toast, thoroughly crisped, may be eaten, and will prove a consolation.

Prince Bismarck's physician cured him of a tendency to obesity by forbidding him to drink anything at meals—a practice which, for some reason not satisfactorily explained, seems to have a tendency to make people fat. As for tea and coffee, they are usually taken too hot. Few persons realize that they habitually swallow such fluids at a temperature which, if applied to the hands and feet, would inflict painful scalds. Most tea drinkers imbibe that beverage at 140 to 145 degrees Fahrenheit, while the cup itself is too hot to be held by the hand, yet no one can endure a foot bath above 115.

OLD PEOPLE USUALLY LEAN.

A person who is in a perfectly normal physical condition cannot get overplump, no matter what or how much he eats. Fat is a sure symptom of unhealth, and, if it increases beyond a certain point, it becomes a disease and promises a shortening of days. Sir Henry Thompson, a famous authority, says: "Not one fat person in fifty lives to what is called a good old age. The typical man or woman of 80 or 90, still retaining a respectable amount of energy of body and mind, is lean and spare, and subsists on moderate rations."

How many old people do you know who are overfat? Count them on your fingers, and you will find they are exceedingly few. The reason is that corpulent persons rarely reach old age; they die first. For corpulence does not signify merely an excess of stomach; it means that there is an accumulation of fat around the heart and other vital organs, which interferes with their working. On this account it is that a stout person puffs and pants while walking upstairs. The heart pump, being clogged, finds difficulty in performing the extra work demanded of it.

Unfortunately, such a condition of the body gives rise to a tendency to the accumulation of more fat, and so the mischief grows. It follows that the only proper and reasonable thing to do is to take the trouble at its beginning and, by a few little self-denials in the way of diet, prevent it from getting a start.

SHOULD FOOD BE SALTED?

This is no new question, but apparently it is not settled, says the Revue Scientifique. In an exhaustive discussion of it M. Rene Laufer concludes that while salt is absolutely necessary to the animal or-

ganism, enough of it for our needs is contained naturally in our ordinary articles of food, so that the addition of it as a condiment is superfluous. Tales of disease caused by lack of salt he dismissed as untrustworthy. Says M. Laufer:

"The desire for salt is certainly universal. It seems to have been used everywhere at all times and in all civilizations. The same salt seasons today the miserable portion of the Sudanese negro and the choice dishes of European tables. * * * The need of salt is not limited to man; many animals seek it with avidity. * * * So general a prediction, so imperious a desire should not be regarded as a simple incident, that is certain; but do they correspond to an unavoidable necessity?

"Is it not curious that the chloride of sodium should be the only salt that we take from nature to add to those contained in our food itself? Other mineral substances play a much more important part in the constitution of the tissues, the salts of lime and the phosphate of soda, for instance. * * * When we use these by themselves it is as medicine.

"The taste for salt is not innate or instinctive; it is acquired. The mother's milk contains very little salt. Cow's milk has at least four times as much, but even this amount the adult who should live on milk alone—say, three quarts a day—would take more chloride than he needs.

"Man in a state of nature does not suit his food. Primitive people who lead a pastoral and nomadic life do not add salt to what they eat. * * * The same is true of animals. Dogs and cats do not like salt. Even the domestic herbivores get along very well if salt is not added to their food."

M. Laufer discredits all tales of illness from the discontinuance of salt. The French soldiers who were said to have suffered from lack of salt in the siege of Metz did so, he says, simply because they required it to hide the taste of the spoiled meat that they were forced to eat. The story of the Russian serfs who are reported to have fallen ill when deprived of salt by their lords bears on its face, M. Laufer thinks, marks of its falsity.

Among the chief morbid symptoms said to follow the lack of salt is edema, or swelling, but the writer shows that nowadays a diet without salt is prescribed for this trouble, and has been effective in curing it. In the same way he disposes to his satisfaction of all the different ills said to arise when one is deprived of salt.

Finally, he calculates the amount of salt necessary to carry on the processes of organic animal life and the amount lost by excretion and comes to the following conclusion:

Our food, provided it constitutes a proper regimen in the physiologic sense of the word, contains in itself and with no necessity of adding to it from outside, sufficient salt for our needs.

PART OF WOMAN'S PRICE FOR VANITY.

Dermatological surgery has advanced under the influence of woman's pursuit of beauty until it has become one of the money-making institutions of city life. Projecting or ill-shapen ears, hare lip, thick and protruding lips, humped, flat or

crooked noses, all can be reduced to normal lines; and facial blemishes, such as freckles, moth patches, scars, birthmarks, smallpox pits, moles, superfluous hair, liver spots and eruptions will yield to the right sort of treatment—and the mighty dollar. No scale of prices for these operations can be quoted. The specialist gauges his price by the financial rating of his patient. An operation may cost fifty dollars or five hundred dollars, according to the will of the operator.

Dimples are inserted by surgical methods, and a double chin is removed by one of two ways. The chin is laid open and the surplus tissue is removed, after which the skin is sewed together, and by modern methods of surgery all traces of the stitches are removed. By the use of anesthetics or cocaine, this is practically a painless operation, but it is less effective than the newer method of irritating the skin of the face and chin by some secret process which draws the superfluous abundance of flesh away from the chin and distributes it evenly over the rest of the face.

SKINNING THE FACE FOR A COMPLEXION.

Women will flinch at the thought of a visit to the dentist, or make much ado over some trifling cut or burn on the hand, but they will cheerfully submit to the shocking and painful process known as facial skinning.

In this operation the entire upper layer of the skin of the face and neck is eaten off by acids, and a new layer is grown with what is promised to be the first flush of youth. It is generally known that the "Jersey Lily," Mrs. Langtry, undergoes this operation as often as once in three years, and to this she owes her much-vaunted "English complexion." But it is not generally known that she pays five thousand dollars to a French specialist every time she undergoes this operation.

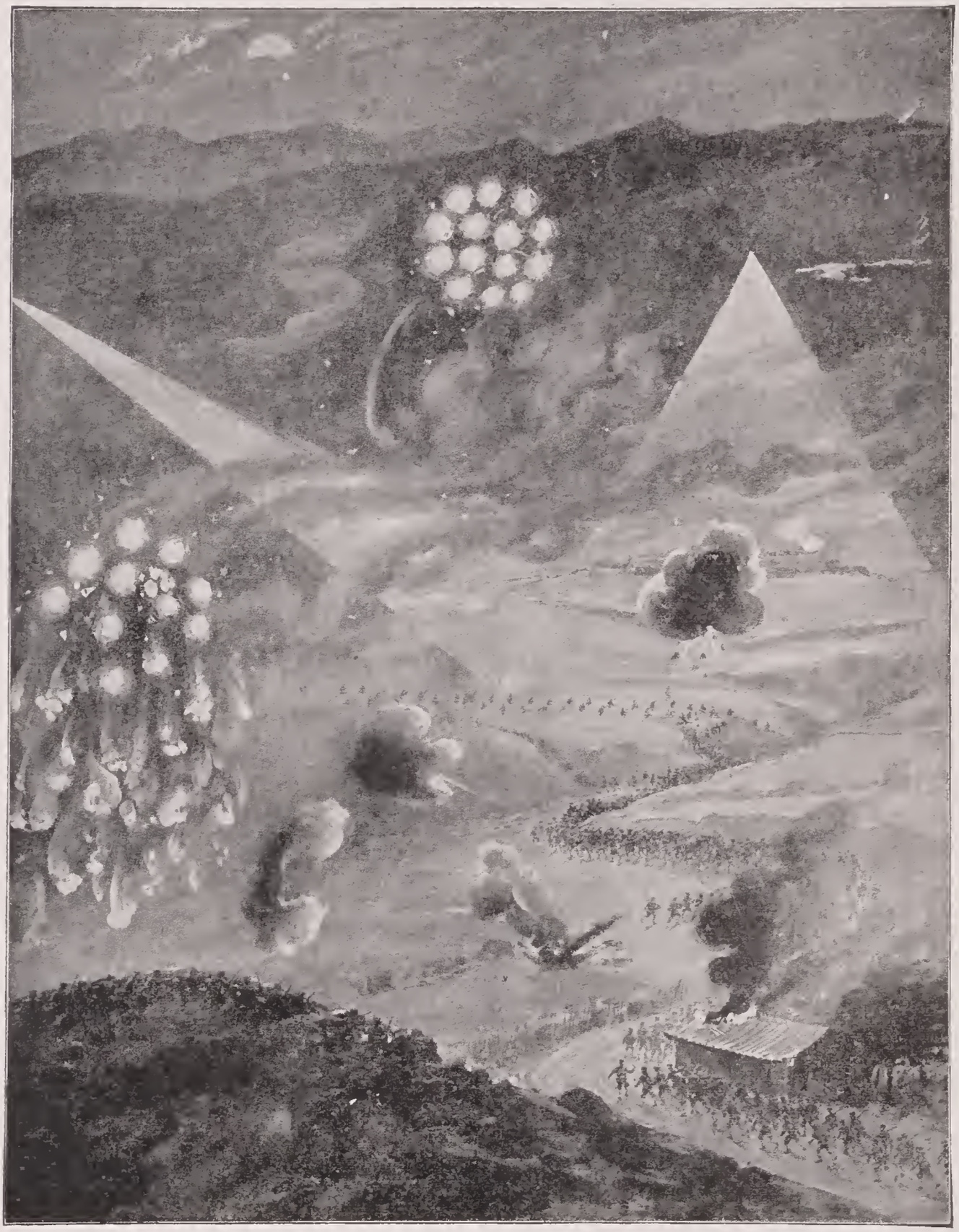
Nor is she alone when undergoing the treatment. At the same sanitarium in Paris are many other women, Americans in the majority, who are willing to take chances with their lives to acquire a "baby" complexion. The operation represents complete isolation for two weeks, during which time the patient should neither speak nor laugh, because any facial expression, or grimace, or active use of the muscles of the face, breaks the delicately new-formed skin and undoes the work of the specialist.

It must not be thought that the actress is the main support of the beauty specialist. The actress of the hour is too busy a woman to pursue beauty as patiently as does her lay sister. It is the society woman, the millionaire's wife, and many a foolish woman who cannot afford the luxury, who are the main support of beauty shops.

HOW THE THIN WOMAN WRECKS HER HEALTH.

Education and science have done much to open the eyes of women regarding the care of her body and her health, but they have not cured her of many follies. She still eats arsenic for her complexion, still petrifies her eyes by the use of belladonna, still takes anti-fats to reduce her weight, and swathes her body in rubber bands for the same purpose.

The thin woman does the most dangerous thing of all when she submits to



War at night under search lights and fire-works. Japanese lighting up Russian positions at Port Arthur.

paraffine injections with the hope of taking on flesh. The paraffine is injected under the skin, much as morphine or any other narcotic, with the expectation that the blood will absorb it and make flesh. What the blood generally does absorb is poison in its worst form, and the woman's health is wrecked for life.

But many a woman will take any chances to gain beauty. She will even allow a facial surgeon to lay open the skin on that most delicate point, the temple, cut out a V-shaped place and join the skin, so that her cheeks, which have grown flabby, will be raised or drawn up to resume the old rounded contour.

The most striking evidence of the statement that many a woman will pay any price, even that of health, is shown in the rushing business done by a New York sanitarium whose specialty is undoing the mischief wrought by irresponsible, so-called beauty doctors. Here come women with ruined digestions, disfiguring eruptions, with blood poison in its most virulent form—all the result of a profitless, foolhardy chase after beauty.

If the woman who plays the social game for all it is worth and is compelled to supply by artificial means the loss of sleep and to repair by the same means the ravages of eternal excitement, indigestible foods and social strenuosity in general, will sit down calmly and figure up her expenses, she will find that it costs her about five thousand dollars a year to keep her hands and her eyes in condition.

This expense item does not include doctors' or dentists' bills or the services of her maid. It represents only what she pays to beauty doctors, masseurs, manicurists, hairdressers and chiropodists. Her maid has time only for dressing her mistress, preparing her bath, perhaps, and laying forth her raiment. Specialists in the other arts of the toilette are called in at regular intervals, and in every large city there are house-to-house manicurists, hairdressers and masseurs who make a good living, either on their own account, or by working on commission for some recognized beauty doctor.

The woman who can pay five thousand dollars to make herself presentable gives up the price cheerfully, almost carelessly. The woman who can spend only five hundred or perhaps even fifty dollars grieves at the smallness of her allowance for such expenditures.

NEW YORK BEAUTY MAD.

In no city in the world is this mad search for beauty carried on so frantically as in New York. Here come women from all over the United States in search of beauty specialists, not because they have no beauty doctors in their own town, but because they prefer to have the transformation wrought away from home, trusting that such a trifling change as having the hair dyed from copper color to black will be laid, not to the hair specialist, but to the change of climate and scenery.

The very atmosphere of New York life, its showiness and its frothiness, make women place a false estimate on the value of beauty and appearance. The average New York woman is a monomaniac on the subject of being well groomed. A woman engaged in business or art pursuits, making perhaps twenty-five dollars a week, will cheerfully pay one-fifth of this sum to the proprietor of a beauty

shop. She lays it aside as a weekly tax.

This amount paid regularly to the same beauty parlor will insure her the following attentions: Her hands manicured twice a week, her hair shampooed once a week and dressed daily, and one facial massage. These rates are secured only by special arrangement, and the beauty doctor, like the dentist, has a sliding scale of prices. He has a shrewd and not unkindly way of charging his regular customer in proportion to her possessions.

A woman who goes to the shop will pay fifty or seventy-five cents to have her hands manicured. If she has a house-to-house manicurist she will pay from one to two dollars, according to the standing of the shop which she patronizes, and she will tip the girl in addition. Her hands are done once a day usually before she arises in the morning or directly after she has her chocolate.

THE HAIRDRESSERS' GOLDEN HARVEST.

The prices charged by hairdressers are also variable, but it is seldom that a first-class hairdresser will build a coiffure for a ball under five dollars. Three dollars an hour is the minimum price for a good masseur. A combination of electrical treatment and facial massage given at home will cost five dollars an hour; and during the social season the woman who begins to note the footmarks of time on her face will have this done once a day. Two dollars and a half is the price of scalp massage, and the woman who fears her hair is coming out, or who notes that it is lacking in lustre, will endure this treatment and the price thereof for another hour.

Every beauty-seeking woman has her fad in the way of baths—Turkish, Russian, electrical, sun or anatomical scrub. The last named includes a species of massaging on scientific principles and is extremely expensive.

The figures given above show merely what is paid for keeping the skin in good condition. It does not include artificial aids. A woman will endeavor to rest at night with her face clutched in a complexion mask, which is to the old-fashioned curling pins what the instruments of the Inquisition were to the tickling of a fly. She will insist that she can sleep in this mask, and pay a hundred dollars for the privilege of doing it. However, an up-to-date woman would rather sacrifice some of the daytime hours to masseurs and complexion specialists, and she is perfectly willing to pay two hundred francs, or forty dollars, for a pot of rouge smaller than a napkin ring.

EVERY MAN HAS HIS PRICE.

There is a very common saying, "That every man has his price," meaning that every man has a price at which he will give up honor and character, falsify every obligation of duty and betray every trust confided to him.

This infamous expression has been so often uttered by word of mouth and in print, that many people have come to regard it as true, and they quote it as a proverb, when it is a vile slander on human nature and is only the defense

made by those who have sold themselves.

It is not surprising that every rascal wishes it were true so that he would not feel ashamed and humiliated in the presence of honesty, virtue and honor, but he knows better. He knows, if he has any experience with the world, that there are men who have withstood great temptations to do evil and have remained faithful to the end, and even the dishonest classes respect such a man.

The history of the human race from the beginning is a record of the good and the bad, living together in the same community and engaged in the business of life more or less together. No community in no age of the world has been so absolutely under the domination of evil that there were not left in it some honest, upright and faithful men. When one of the ancient holy prophets declared his belief that all the people of the country in which he lived had gone after false gods, he was rebuked by the divine information that there were still among them seven thousand men who had not bowed the knee to Baal.

The annals of the human race are filled during periods of centuries with the glorious history of the Christian martyrs whom neither the offers of power, position and all the pleasures that heathen luxury could tempt, nor the threats of immediate and most cruel torture and death intimidate, but who remained true to their principles and every obligation of duty, and went to the stake, to the axe and to the torture chamber with the courage and fortitude that only a sublime sense of right, of honor and truth could create. But the heroes of truth, virtue and honesty have never been confined to any age. They have stood as examples at very period of the world's history to cheer on and strengthen for the battle of life and the irrepressible conflict with evil their comrades and those who should come after them; and today they are no more lacking than at any other period.

HOW TO CULTIVATE MEMORY BY SIMPLE MENTAL EXERCISES.

Many people complain of having a poor memory, and yet that faculty can be developed as easily as can the biceps muscle. Nor is it necessary to go to any professor of memory or to master any elaborate system in order to accomplish this result. One does not have to go to a gymnasium to strengthen the arm or back. Chopping wood or rowing a boat will do it. Similarly, memory may be cultivated by an effort and amid ordinary pursuits.

One man made the Sunday service of his church serve as a memory exercise. After the service he would endeavor to call the numbers of all the hymns sung, the chapters and verses of the lessons, words of the anthem, the text and points of the sermon. This required paying close attention and a conscious effort to impress these things upon his mind. By this and other equally simple means he developed a memory that was absolutely at his command.

Famous speakers who have memorized their speeches have adopted various simple devices to aid them. One noted orator

Section of monster cranes used for carrying away the huge blocks of stone blasted from the bed of the Chicago drainage canal.

fixed in mind the different points in his speeches by first drawing little figures or pictorial representations. If part of his speech had to do with a bridge he would make a little sketch of such a structure, or, if with Cuba or the Philippines, he would sketch a small map of these islands. He could remember these little figures or pictures. When he rose to his feet he could see them in imagination and select them one by one as he proceeded from point to point in the address, not having any note or manuscript by him at all. That was the method best suited to him.

Certain people possess what may be called the bump of location. If they remember a passage in a book they can tell you which side of the page it is on and on what part of the page. There are students with that kind of a memory who prepare their recitations by taking a large sheet of paper and writing different parts of the lesson in different places on the paper. They then rely on their sense of location to call to mind whatever they wish to remember.

Again, there are people who have a keen eye for color. They will make their memoranda on slips of paper of different colors. Then simply calling to mind a particular color will enable them to remember the memorandum associated with that color. Of course, all this is based on what is known as the faculty of association of ideas.

Some people who can remember words and phrases find difficulty in remembering figures or numbers. In such cases a curious expedient has sometimes been resorted to. A phrase will be devised, the initial letters of which suggest the figures sought to be remembered. For example, suppose some ones street number to be 182. The suggestive phrase might be "I seek him." The letter I will suggest the figure 1; the letter S somewhat resembles an 8, and the two perpendicular strokes of the H suggest the Roman numeral II. A roundabout method this may be, but it has served to fasten figures in the memory of people who had previously found them troublesome.

But perhaps the most wholesome way in the long run is simply by repetition and effort to fix the thing in the memory directly without tricks of memory or artificial methods. By memorizing each day one sentence or verse from the best literature the mind will soon have a fine treasury of beautiful thoughts and an enriched vocabulary.

For quotation purposes it is necessary to remember verbatim, and though this is the hardest task of memory, it well repays the effort. Once trained, the memory will be able to recall the exact words of conversations, sermons and passages in books without having made any conscious effort to commit them.

STRANGEST NEWSPAPER IN THE WORLD.

Budapest has a newspaper that always "scoops" its rivals and is able to issue an extra literally on a minute's notice. The name of this unique journal is Telefon-Hirmondo, the telephone newspaper. Having been in existence for over ten years, it has ceased to be an experiment. The news is gathered and handled precisely as in the

office of an ordinary newspaper, except that instead of putting the type into forms for the press galley proofs are given to six stentors, with strong, clear, distinct voices, who speak the news into receivers connected with wires leading to the homes and business places of subscribers, of whom there are 6,200.

A complete programme is tacked to the wall above each subscriber's receiver, so that he can tell at a glance what department of news is to be expected at any hour, every day except Sundays and holidays having the same programme. The issue begins at 10:30 a. m. and ends about 10:30 p. m., unless a concert or some late-at-night event is to be reported. The stock exchange reports reach subscribers several hours ahead of the evening papers. At 1:30 and 6 p. m. comes a resume for those who have missed the earlier news. From 5 to 6 there are concerts, varied by literary criticisms, sporting news and so on. Special items for Sunday are: 11 to 11:30, news; 4:30 to 6, a concert. On Thursday evening at 6 comes a concert for children.

To facilitate the service the city is divided into twenty-seven districts, with a main wire to each district and branch wires into the houses. An accurate map of the system hangs in the office. The company owns its own wires and plant, and has the same right to place wires enjoyed by the telephone and telegraph companies. Twenty-seven copper wires run from microphone receivers at the opera house to the central office. There the current passes through a patent device which increases the sound, its distribution to subscribers also being regulated by an ingenious patent device.

It might be inferred that such a newspaper would be costly to its patrons. As a matter of fact, each of the 6,200 subscribers pays about $7.50 a year, or a trifle over 2 cents a day. The paper carries a fair amount of advertising. It is always able to guarantee that the "ads" will appear "next to reading matter," for the "ads" are sent over the wires between items of news, and the stentors are particular to enunciate the "ads" in such a way as to make them attractive. Instead of using display type, this paper uses display tones, and a stentor who knows his business can fairly make people believe they want the articles advertised.

The expenses of the newspaper are about $45,000 a year, while its receipts from subscribers are nearly $47,000 a year. As the advertising, at the rate of 42 cents for twelve seconds of space, amounts to a small fortune in the course of a year, it will be seen that the company is paying good dividends on its capital stock of $250,000. The company expects to have sufficient surplus soon to warrant a reduction in the cost to subscribers.

A LIBRARY 8,904 YEARS OLD.

TABLETS TAKEN FROM ONE AT NIPPUR DATE BACK 7,000 B. C.

The oldest city public library in the United States is that of Boston, which was founded in 1851. That makes it very old, according to our standards. But Prof. Angelo Hilprecht of the University of Pennsylvania has been examining a

library, and a public library of some sort, which is a little older than that. It consists of a mass of documents, inscribed in cuneiform letters on tiles, in a wing of the temple of Baal at Nippur, the ancient Babylonian city which lies between the Tigris and the Euphrates.

Prof. Hilprecht had already dug out of the ruins of this temple about 30,000 commercial, legal and literary tablets, and this last summer he has found 4,000 more. The tablets which he has discovered this year are the oldest ever, so to speak, for he declares that they date back as far as 7,000 years before Christ.

This discovery is startling in more senses than one. If the familiar and so-called biblical chronology is right the Nippur people had a library of documents and stories, probably free to those who could read them, some 1,336 years before Adam was created—or, according to Archbishop Ussher's chronology, 1,192 years before it; for this learned man supposed that exactly 4,004 years had elapsed from the creation of Adam to the birth of Christ, and 1904 years are supposed to have nearly elapsed since that date.

This chronology has been somewhat discredited since Archbishop Ussher made his computations, and discredited largely as the result of such discoveries as those made by Prof. Hilprecht in Babylonia. It is to be said, however, that the more the old Assyrian or Babylonian records are looked into the more they increase the respect of students for the Hebrew scriptures.

Reverence and authority most always go with the record which survives in men's lives and thoughts. Ages after the temple of Baal and its great library had been "a possession for the bittern, and pools of water," and after the very dust of the last survivor of the old librarians had vanished from the interior of its tomb, the stories of Genesis were still told by the living successors of the priests who compiled them.

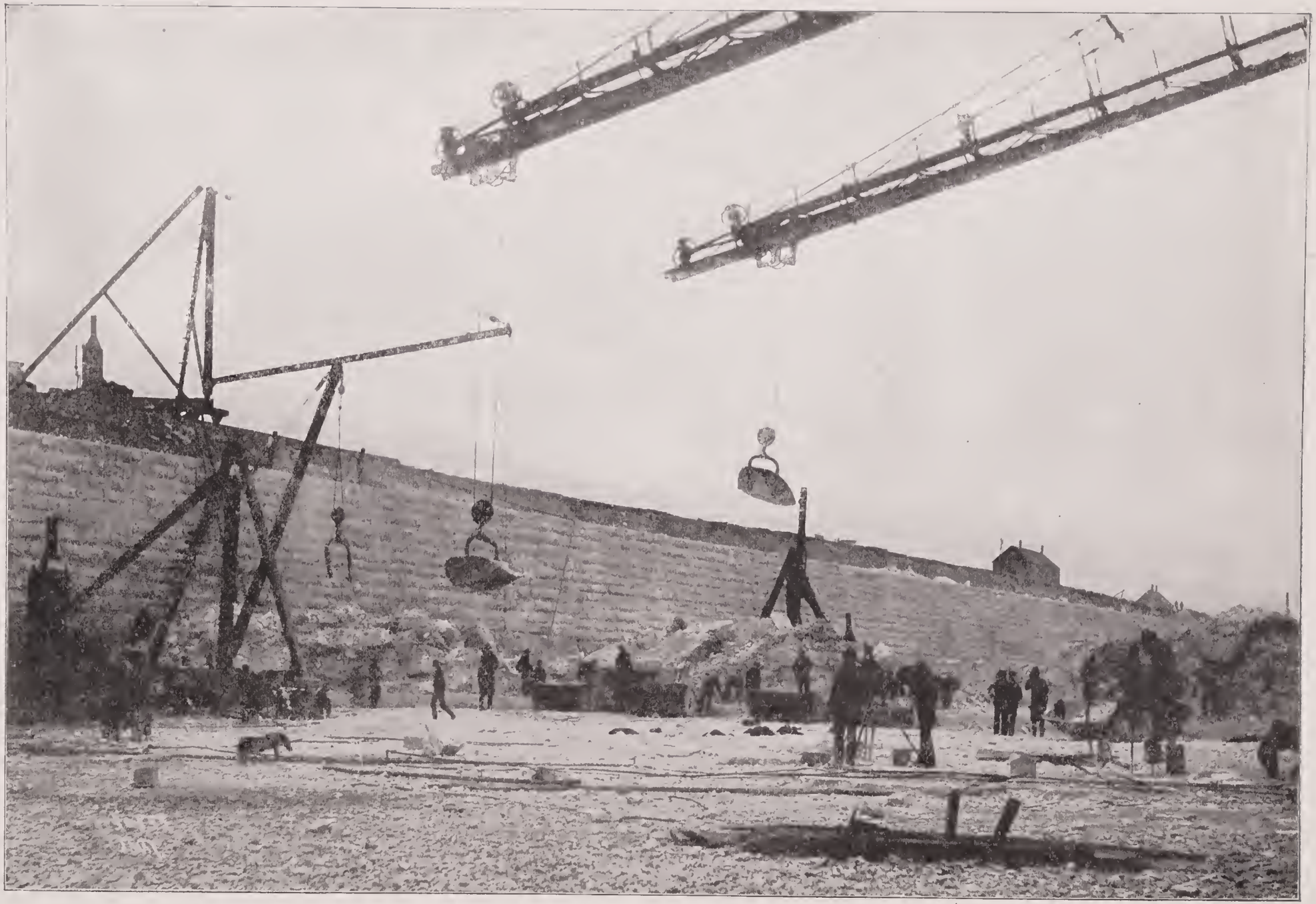
MISCELLANEOUS FACTS OF GENERAL INTEREST.

HERDS OF WILD CAMELS IN THE UNITED STATES.

Camel-hunting in Arizona and camel-raising on a ranch is the latest idea on which William Sells, son of W. A. Sells, showman, is working. Sells says that his father conducted a dromedary hunt in the Cactus plains near Gila Bend in Maricopa county, Arizona, twenty years ago, and managed to capture fifteen of the ships of the desert. Six of them got away or died while being brought east and the other nine went into the circus business.

About thirty years ago the government imported a herd of camels to be used for transportation purposes across the desert. The experiment did not prove a success and the animals were turned loose. Some time later a Frenchman tried to resurrect the business and brought over another herd. He failed also, and also allowed his camels to roam at liberty.

The two herds mixed and increased, and W. Allen Sells, having heard that there were nearly 1,000 of them, started out to round them up. He took a party of cowboys and riders from his circus, some experienced hunters and guides, and



Section of giant cranes used on the Chicago drainage canal lifting away the huge buckets of stone.

tried to capture the animals. The horses, however, would not approach within several hundred yards of the camels.

Sells, nothing daunted, made a second attempt the following year, using as mounts for his party horses which by being in the circus business were accustomed to the camels. Fifteen were captured.

William Sells proposes to duplicate his father's experience. He estimates that there are 2,000 camels in Arizona. With fifty mounted men, carrying lassoes, he will make a raid on the herds, and take those captured to his ranch in Kansas, where they will be broken of their wild habits and trained for circus use.

WORLD'S LONGEST FENCE.

The longest fence in the world is probably that which has been erected by the Erie Cattle Company along the Mexican border. It is seventy-five miles in length, and separates exactly for its entire distance the two republics of North America. The fence was built to keep the cattle from running across the border and falling an easy prey to the Mexican cow punchers. Although it cost a great deal of money, it is estimated that cattle enough will be saved in one year to more than pay for it. It is a barbed wire fence, with mesquite and cotton wood poles, and for the entire length of it runs as straight as the crow flies.

THE GYPSY MOTH.

After spending over a million dollars in trying to exterminate the gypsy moth the State of Massachusetts has given up the struggle, and the insect, which is considered by some to be worse than the San Jose scale, is now free to spread over the whole country, says Country Life in America. A dangerous colony already exists in Rhode Island. The caterpillars eat almost anything green, and they work from the time the leaves come out until about the first of September. A list has been made of 536 kinds of plants they will eat. They have been especially destructive to the grand old elms, for which New England is famous, and they are also fond of our native oaks and willows and all kinds of fruit. Evergreens are stripped and killed in a single year. The caterpillars sometimes crawl all over a house, and many houses have been abandoned by the disgusted tenants. It is five years since the Legislature refused to give any more money, and it would now cost far more to exterminate the gypsy moth than Massachusetts has spent so far. Nevertheless the leading entomologists declare that the insect can be exterminated. Efforts are being made to get the New England States to co-operate. If they fail to do so it will be time for the National Government to take a hand. The gypsy moth is a European insect, which escaped from an entomologists' laboratory, and did not attract much attention for about twenty years.

HOW COFFEE GROWS.

Up to 1690 the sole source of the coffee supply was Arabia, but in that year it was introduced into Java by the governor-general of the island, and the climate was found to be so well adapted to it that cultivation was begun on a large scale. One of the first plants grown in Java was sent to the botanical gardens at Amsterdam, and seed from it was sent to Suri-

nam, resulting in its introduction into that country in 1718. Ten years later it found its way to the West Indies, and from that time its cultivation has been general throughout the inhabited portions of the tropics. The regions best adapted to its culture are well-watered mountain slopes, varying from one to four thousand feet in altitude and between the parallels of 15 degrees north and 15 degrees south latitude.

According to the altitude at which it is grown, the coffee bean varies in size and color, that from the highlands being small and light green, and nearer the coast of a yellow tinge and much larger. The wild trees of Liberia, which flourish in lowlands, produce the largest beans known, which are, however, inferior in quality, as is the case with the majority of the African product. Eastern coffee generally may be distinguished by its yellow color and large beans, as compared with the smaller green berries of Central and South American growth.

In its wild state the coffee tree is slender, reaching a height of twelve to twenty feet, but under cultivation it is pruned to grow not more than six or eight feet high. The leaves resemble those of the laurel, though not so dry and thick, and are evergreen, while the flowers are somewhat like the jasmine. The trees are completely covered with blossoms, which perfume the whole countryside. The fruit resembles the cherry very much, especially when ripe, when it is a dark purple.

ORIGIN OF THE WHITE RACE.

Gustave Michaud, the ethnologist, writes: "We have now every reason to believe that both the Mediterranean and the Baltic branches of the white race are the result of the natural selection practiced by a cold climate upon northward-migrating African negroes. Whatever be the cause of the amount of pigment existing in the skin of the latter, it seems to me that the decrease of it was unavoidable as soon as the race took to traveling northward. In northern countries, natural selection tends constantly to harmonize with the color of the snow that of every animal which hunts or which is hunted: why should the blondness of the northern man have a different origin?

"Primitive tribes were doubtless frequently decimated by hunger, as the Canadian Indians are today. Those hunters who show on the snow a sallow face, black hair and beard, dark eyes, worked at a disadvantage when compared with somewhat lighter-complexioned comrades. They were more conspicuous on the white field, and could not so easily approach their prey within striking distance. In time of famine, mortality was the greatest in their families.

"This eliminating process was repeated generation after generation, the light-complexioned individuals always leaving the larger posterity. However small may have been the difference in the mortality, we know today that a characteristic against which such a process is at work, always in the same direction, is doomed to disappear."

CURIOUS BELL SOUND ON RED SEA.

A singular phenomenon occurs on the borders of the Red sea at a place called Nakous, where intermittent underground

sounds have been heard for an unknown number of centuries. It is situated at about a half-mile distant from the shore, whence a long reach of sand ascends rapidly to a height of 300 feet. This reach is about 800 feet wide, and resembles an amphitheater, being walled by low rocks. The sounds coming up from the ground at this place recur at intervals of about an hour. They at first resemble a low murmur, but ere long there is heard a loud knocking something like the strokes of a bell, and which at the end of about five minutes becomes so strong as to agitate the sand. The explanation of this curious phenomenon given by the Arabs is that there is a convent under the ground here, and that these monks ring for prayers. So they call it Nakous, which means a bell. The Arabs affirm that the noise so frightens their camels when they hear it as to render them furious. Philosophers attribute the sound to suppressed volcanic action—probably to the bubbling of gas or vapor under ground.

EXTRAORDINARY VITALITY OF CERTAIN SEEDS.

The length of time seeds will preserve their vitality differs amazingly in different plants. The seeds of the willow, for instance, will not germinate after having once been dry, and their germinating power is lost in two weeks even if during that interval they have been kept fresh. The seeds of coffee do not germinate after having been kept for any considerable length of time. The grains of wheat lose their power and strength after a lapse of seven years, though wheat over two centuries old has been quite capable of being used for food.

The story of "mummy wheat" sprouting after having lain dormant in Egyptian tombs for thousands of years, to say the least, sounds exceedingly dubious. No well authenticated instances of such finds are extant, while among other articles sold by the Arabs to credulous travelers as coming out of the same tomb as the ancient wheat have been dahlia bulbs and maize, the deposition of which, in the receptacle from which they were said to have been taken, makes it necessary to believe that three thousand years ago the subjects of Pharaoh were engaged in commerce with America. Rye and wheat only 185 years old could not be induced to germinate, the place of the embryo being filled with a slimy and putrefying liquid. When kept secluded from light and dampness seeds have been known to keep for lengthened periods.

The most unscientific observer has noticed how often plants appear in old ground which has been trenched which have never appeared in such spots previously, and that after fires pass over localities plants equally strange to the neighborhood appear. It is noticed that when an American forest is fired the trees that take the place of the burned ones are of a different species from those hitherto observed in that neighborhood. After the great London fire in 1666 the yellow rocket appeared in great profusion for the first time in the district swept by the fire. These facts, which cannot be denied, have led to the theory that seeds may lie for long periods dormant and only spring into life when some stimulus, such as exposure

Photograph showing construction of dome on the Chicago Postoffice.

to the sun, rain or heat, is applied to them.

A scientist has recently discovered that an extensive tract of land at the silver mines of Laurium, in Greece, is covered by a luxuriant growth of horned poppies belonging to a hitherto unknown species. These plants have shot up through soil which has been covered to the depth of ten feet with the masses of cinder and slag thrown out by the workmen in ancient times when the mines were worked by the Greeks, and which have been recently disturbed in order that the imperfectly fused materials might be subjected to further process of fusion for the purpose of extracting their silver contents.

MOST REMARKABLE PLANT KNOWN.

Mrs. A. R. Cottrell of Minneapolis, Minn., has a night-blooming cereus that is 23 years old. Horticulturists pronounce it the most remarkable plant of its kind known to horticulture. It came into Mrs. Cottrell's possession when it was 17 years of age, up to which time it never bloomed. But she began to care for and feed it, with the result that it bloomed that year. The following year it was nonproductive, but each year since that time it has borne a number of flowers, some years having as many as six well-developed blossoms, besides a number of buds.

The characteristic of this species of plant is that it blooms only at night. Usually it opens as soon as it has become thoroughly dark in the evening, or about 9 o'clock, and remains open until about 2 o'clock in the morning, when the bloom begins the slow process of folding its petals forever, which requires about two hours. Two years ago the plant developed a freak by one bloom remaining open constantly for thirty-two hours. The flower opened one evening about 6 o'clock. The evening was dark and rainy. The following day developed the same kind of weather and exceptionally heavy clouds lined the heavens during the entire day. With the approaching dawn the delicate bunch of fragrance showed no signs of its passing.

During the day hundreds of persons viewed the remarkable freak of nature, which remained open until about 2 o'clock the following morning. This year it has borne three blooms and the fourth one shows signs of opening.

EXAMPLE OF THE TYRANNY OF MILITARISM.

Militarism is responsible for another astonishing travesty on justice. Two musketeers were charged at Dessau with rioting and assaulting a superior officer. This officer, named Heine, entered a dancing saloon, intoxicated, and jostled and struck the partners of the musketeers, who on protesting, were attacked by Heine with drawn sword. They wrested the weapon from him, for which the prosecution asked that they be sentenced to five years at hard labor, dismissal from the army and loss of civil rights.

When the prisoners' counsel asked whether it was contended that soldiers had no right to act in self-defense, the prosecutor answered:

"Just so. Self-defense is a conception which does not exist in the relations between soldiers and their superiors. The

inferior has the right of complaint, but not of resistance. It is absolutely necessary that a soldier should allow himself, if necessary, to be slaughtered by an officer, though the latter be making illegal use of the weapon."

The court pronounced sentence as demanded, while Heine got only three months without loss of rank for being intoxicated.

A few weeks previous to this, as the emperor was riding through the streets of Berlin, the people as usual were shouting their honors to the king when an old woman was heard to call out, "Honor to God, Honor to God."

She was at once arrested for insulting his majesty and imprisoned. An appeal was made direct to the emperor for her release but she had to serve out her term.

THE VASTNESS OF SPACE.

The greatest living astronomer, Prof. Simon Newcomb of the United States Naval Academy, gives some idea of the infinity of space as follows:

Imagine around our solar system as centre a sphere with a radius 400,000 times the distance of the sun, which is 92,000,000 miles. Light, which leaps around the earth seven times in a second and reaches us from the sun in eight minutes and twenty seconds, would require seven years to reach us from the surface of this sphere.

In that enormous space there is only one star besides our sun.

Imagine another sphere with a radius twice that of the first, and, therefore, with a volume of space eight times as great.

In that space there are only eight stars.

But, there are one thousand millions of stars within the reach of our present telescopes.

The milky way, the most distant of them, is 400,000,000 times the distance of the sun from us, and its light requires 6,600 years to reach us. The light we see tonight started 4,700 years before Christ was born. The milky way may have been destroyed last night, but nobody on earth will know it for nearly 7,000 years.

The whole heavens blaze with the light of countless other stars invisible to the greatest telescope, though the light proves their existence.

Besides the luminous stars, there are probably millions of dark stars, forever invisible to man.

And, outside and beyond this visible universe of ours, there are others, reaching on, and on, and on—forever!

LARGEST FLOWER KNOWN TO SCIENCE.

The rafflesia is a strange plant. It grows in Sumatra and derives its name from Sir Stamford Raffles, governor of Sumatra at one time, and his friend Dr. Arnold, a naturalist. They were the first white men to discover the wonderful plant. It is said to be the largest and most magnificent flower in the world. It is composed of five round petals, each a foot across and of brick-red color, covered with numerous irregular yellowish-white swellings. The petals surround a cup nearly a foot wide, the margin of which bears the stamens.

This cup is filled with a fleshy disk, the upper surface of which is everywhere covered with projections like miniature cow's horns.

LIST OF INVENTIONS THAT WOULD BRING VAST RICHES.

The United States ship Albatross recently returned from a long cruise, during which she crossed every ocean in the world. The object of the cruise was deep sea soundings and other scientific purposes. In the course of these soundings the trawl brought up from a depth of about two miles an extraordinary collection of nodules of pure manganese. This metal, which is largely used in the arts and in medicine, is so hard that it will scratch glass. It is extremely valuable, and on land is practically never found in a pure state.

Further investigation proved that huge areas of the floor of the Pacific are strewn thick with immense deposits of this valuable substance. Invent a practicable and economical method of recovering it, and the individual who does so will at once become rich beyond the dreams of avarice.

The difficulties in the way of such an invention are many, and the experiments would of necessity be costly. But it is not necessary for the ordinary man to go so far or spend so much in order to attain wealth and, incidentally, fame. For instance, there is nothing like leather for shoes; yet leather is expensive, and constantly becoming more so. The demand is always increasing. The population of the civilized world increases, and with it the demand for boots and shoes. Find a satisfactory substitute for leather and your fortune is made.

It has been frequently asserted that the average inventor never makes any money. Constant repetition has made it almost a proverb. There are plenty of instances to prove its utter falsity. The copper shoe-tip made its inventor wealthy. The hook and eye, with a hump so that it cannot fall apart, is another example of a small idea which made its deviser a rich man. The shoelace fastener, the glove catch which superseded the button, the collar-buttoner—all these proved gold mines.

The most crying need of today is a substitute for Para rubber. It is certain to be discovered sooner or later. Celluloid and oxidized linseed oil are useful for some purposes for which rubber is used, but for cycle and automobile tires real rubber is still the only material with the necessary elasticity. The inventor of a substitute would soon become a multi-millionaire.

Gutta-percha is rising in price every year. For golf balls it has never been superseded. Find a good golf ball substitute and you will leap to millionairedom. For the purpose of insulating submarine cables gutta-percha is the one and only substance at present known. The market for a substitute is enormous.

When asphalt was brought into use for the paving of streets people said: "Now the problem is solved for making a perfect road." But it was not. Asphalt is expensive. It does not wear well. It gets greasy beyond words, and dangerous for man and beast. There are a host of objections to wood pavements, both on wearing and on sanitary grounds. In his "Anticipations" Mr. Wells, the British engineering expert, speaks of the perfect roadway of the future, tough, resilient, waterproof,

noiseless and clean. Here is another road to wealth.

Gas makers paid the inventor of acetylene gas something like $500,000 for his patents, under the impression that acetylene could be used as a substitute for naphtha for enriching water gas. They wasted their money, for it has since been found impracticable to use it in this way. Water gas can be made for about 6 cents a thousand feet, but it gives no light until enriched by naphtha. This multiples its prime cost by six. If any one can discover a cheap means of enriching water gas, either by acetylene or other means, he has a vast fortune awaiting him.

It costs ship owners thousands of dollars to clean the bottoms of their vessels. Steel vessels get foul in a very few months, and lose their speed. Dozens of anti-fouling paints are on the market, but all of any practical use are very costly. The genius who can invent a substance which will prevent steel submerged in water from rusting will be a benefactor to his country, and should incidentally acquire great wealth, if he patents his invention.

Another thing which marine engineers are clamoring for is something to prevent scale from forming in boilers. So far the problem has never been satisfactorily solved. Boilers have to be cleaned out by hand at intervals—a lengthy, tedious and expensive piece of work.

Malleable glass was manufactured and used by the Romans nearly two thousand years ago. But the secret has been lost. It seems odd that no one in this age of mechanical progress has been able to re-discover the method of manufacturing a tough and unbreakable glass. Whoever succeeds in doing so and making the discovery economically useful will reap a great reward.

Real photography in colors is still an open field and offers boundless opportunities for the inventor. In smaller matters, too, the list of wants unsupplied is endless. Jewelers, for instance, are still quite without any safe method of fixing pearls on jewelry such as rings, where the gems are mounted without a surrounding setting.

Among other great wants may be mentioned an automatic stoking apparatus, a perfect portable water filter, a method of making industrial use of liquid air, and an apparatus for harnessing and turning to advantage the immense waste forces of the tide.

HAND WORK VS. MACHINE WORK.

Between the efficiency of hand labor and that of machine labor, the difference is known generally to be very great. But it was not until the United States Bureau of Labor investigated the matter that the real difference was learned.

The bureau's report shows clearly and precisely what the difference is in many branches of manufacture and agriculture.

Here are some of the comparisons made:

To produce 100 bushels of barley it took 211.94 hours of labor seventy

years ago; today, with the aid of machinery, it takes 9.04 hours.

To produce 160 bushels of oats it took 265 hours in 1830; by machinery it takes 28.39 hours.

To drill six 2½ inch holes 1½ feet deep in hard blue rock took 180 hours when only hand work was used; by machinery only 8 hours and 12 minutes are needed.

It used to take 200 hours to load 100 tons of iron ore on cars when men shoveled it by hand; machinery loads the same amount in less than three hours.

When hand work alone was used, nearly four weeks—240 hours—were needed to transfer 200 tons of coal from canal boats to bins 400 feet away; now the work is done by machinery in just 20 hours.

Seventy years ago it took 200 hours to make 50 12-inch pitchforks; now machinery makes them in 12.83 hours.

During the "sixties" hand work turned out a buggy in 200.42 hours; machinery turns out a better carriage of the same style in 39.14 hours.

Thirty-six thousand newspapers were printed and folded by hand in 216 hours; by machinery they are turned out nowadays in 1.08 hours.

It used to take 281 hours when only hand labor was used to print 1,000 sheets of lithographic art work in six colors. Machinery does the work in 5 hours and 40 minutes today.

One hundred thousand ems of type were set by hand in 209.60 hours; machines set the same amount in 45.45 hours.

Hand work will dress 160 square feet of granite in 243 hours; machinery will do it in 19 hours.

In every other branch of work there is a similar saving of time by the use of machinery.

DISCOVERY OF A SINGLE MEANS FOR PURIFYING LARGE BODIES OF WATER.

The Department of Agriculture, not content with ransacking the world for animal and plant life which will add to the wealth of this country, not satisfied with the many wonderful accomplishments of its experts in biology and chemistry, such as the discovery of means for inoculating sterile soil and making it bring forth fruit in abundance, is now able to announce that it has about perfected a method for purifying water, a method as simple and inexpensive as it is valuable.

Blue vitrol, or copper sulphate, mingling with polluted water in the ratio of one part of the former to several million parts of the latter, is the remedy for the ills of a tainted water supply.

One-half of the population of civilized countries depends on stored water for its supply. Not only is there always great danger of disease from contamination but even when serious danger is not present there is a disagreeable stench apt to develop in reservoir water, especially in the summer months.

At times the odor has been so bad that the authorities have dragged the bottom of the reservoir for a dead body, or have been obliged to shut off the supply for months at a time.

The stench is caused by vegetable matter (algæ), which enters quiescent water in some inexplicable way. These organisms multiply at an astonishing rate. If the water is absolutely quiet they are not offensive, but when the water becomes disturbed by pumping or being drawn off, tiny sacs of oil are broken and the foul smell begins. Many experiments have been made for ridding water supplies of these algæ, but nothing effective was discovered until the Department of Agriculture hit upon the plan of using copper sulphate.

By placing 200 pounds of blue vitriol in coarse sacks, suspending these sacks from the stern of a rowboat, and rowing up and down the reservoir for several hours, the water supply of a city in Kentucky was completely cured of its disagreeable smell and taste in three days. The algæ were so dense that a strong dose of the medicine was administered—one part blue vitriol to 4,000,000 parts of water. The cost of the medicine was $12.50. The town, which has been spending thousands of dollars each year ineffectually, has had no further trouble.

While the copper sulphate kills the algæ and other germs resident in the water it imparts no poison that will endanger human life. There is more copper in a can of peas than in 330 gallons of water that have been sterilized by the strongest dose of copper sulphate necessary to destroy algæ and disease germs.

The announcement of the copper cure has brought to light many incidents from the past which tend to confirm its validity. The unwitting use of blue vitriol during an epidemic of cholera in the city of Indianapolis stopped the further ravages of the plague. During the last visitation of cholera in Massachusetts the employes of the Revere Copper works were immune. It is claimed now that the old-time copper-bottom tea-kettle was a preventive of many of the intestinal diseases more common now than formerly.

It is believed that the use of copper sulphate at the origin of water supplies, whether reservoirs or rivers, will keep the water constantly pure. The infection of milk can be prevented by the use of copper. The method of applying the new disinfectant to all the sources of typhoid and cholera germs has not been worked out, but it is safe to say that a successful remedy has been found. Hereafter the inhabitants of towns and cities can be protected from the dangers of an infected water supply by a simple and inexpensive application of copper sulphate.

TELEPATHY AMONG INSECTS.

Not only the unworthy sluggard might observe the ant and other insects and profit thereby. Science each day adds to the wonders which these little creatures are capable of and puts human creatures to shame.

This time it is a sixth sense which a noted scientist has discovered many insects to be fortunate enough to possess. At least they are able to communicate with one another at great distances.

This professor had two ailanthus trees in his yard, and these suggested

the idea to him of obtaining from Japan some eggs of the ailanthus silkworm. He got a few, hatched the larvæ and watched anxiously for the appearance of the first moths from the cocoons. He put one of the moths in a wicker cage and hung it on one of the ailanthus trees. This was a female moth. On the same evening he took a male moth to a cemetery, a mile and a half away, and let him loose, having previously marked him by tying a silken cord about his abdomen, so as to be able to identify him. The idea was to find out if the two moths would come together for the purpose of mating, these two being the only ones of their species within a distance of hundreds of miles.

This power of locating each other had been previously observed in these insects. In the morning the two moths were found to be in the same cage, the female having been able to attract her mate from a distance of a mile and a half.

Comparatively little is known about the ordinary senses of insects. Most of them see well, the eyes of many being far more elaborate than those of the human being. The eyes of common house flies and dragon-flies are believed to be better fitted than the human eye for observing objects in motion,though these creatures are shortsighted.

That insects have the sense of taste cannot be doubted when it is observed how nice they are in their selection of foods. That they have smell is a matter of common observation. Most insects are deaf to sounds which are heard by human beings. At the same time, there is no doubt that they make and hear sounds which are entirely out of range of hearing.

Certain senses in insects appear to be beyond comprehension. The neuters among ants, known as the "termites," are blind, and yet they will reduce a beam of wood in their burrowings without once gnawing to the surface. An analogy is found among animals. A bat in a lighted room, though blinded as to sight, will fly in all directions with great swiftness and with infallible certainty of avoiding concussion or contact with any object. It seems to be able to feel at a distance.

DR. LYMAN ABBOTT'S CONCEPTION OF GOD.

THE FOLLOWING IS A SIGNED STATEMENT BY DR. LYMAN ABBOTT, HENRY WARD BEECHER'S SUCCESSOR IN HISTORIC PLYMOUTH CHURCH, IN REGARD TO THE PRESENT SCIENTIFIC CONCEPTION OF THE BEING OF GOD:

The conception of God as a Great, First Cause, who ages ago set in motion certain secondary causes which control the world, and with which he interferes from time to time as exigency may require, is giving place to a conception of One Great, Eternal, Underlying Cause, as truly operative today as He was in that first day when the morning stars sang together. Every day is a truly creative day. This is the conclusion to which science has been

leading us, expressed in the words of Herbert Spencer, who, though not a great philosopher, is a great interpreter of the scientific thought of his time. "We are ever in the presence of an Infinite and Eternal Energy from which all things proceed." This Eternal Energy is not absent from the universe. It is in the universe. We are ever in its presence. It is not many energies; it is One Energy. Science has dug a grave and buried in it, beyond possibility of resurrection, both polytheism and idolatry. This Energy is an intelligent Energy. The relations of the physical world are intellectual relations; science does not create them; it discovers them. Science thinks the thoughts of God after Him.

While science has thus been leading us to see God in physical nature, philosophy has been leading us to see God in all the events of history. The doctrine of evolution, which is not the same as Darwinism, is the doctrine that the world's progress is from a lower to a higher stage, from a simple to a more complex condition. Thus history is no longer the mere record of great events or the story of great lives. It is the philosophical unfolding of a great development, the end and issue of which is the Kingdom of God on the earth. Matthew Arnold was not an orthodox believer, but he has stated this fundamental doctrine in the sentence, "There is a Power not ourselves which makes for righteousness." This Power is as manifest today in the world's history as it was two thousand or more years ago in the history of Palestine. Any power making for righteousness must be a righteous Power, and righteousness can be predicated only of a personal God. God is present in human history; this is the testimony of philosophy, as God is present in physical phenomena.

But has this God any relation to the individual, so that we can have some consciousness of Him and some connection with Him? Or is there an invisible curtain between the soul and this Power in nature, this righteous Director of history?

Literature is the interpreter of life, and to literature we turn for an answer to this question. And this answer is given to us by great poets, and by no one more clearly and beautifully than by Tennyson:

"Speak to Him, thou, for He hears, and spirit with spirit can meet:
Closer is He than breathing, and nearer than hands or feet."

The notion of a humanized God, sitting in the center of the universe, ruling things, is gone; and in the place of this science has brought us back this: "We are ever in the presence of the Infinite"; and history has brought us back this: "There is a power not ourselves that makes for righteousness"; and literature has brought us back this: "Spirit with spirit can meet; closer is He than breathing, nearer than hands or feet."

Am I then a Pantheist? Is this Pantheism? I suppose there are a great many persons who do feel that this changed conception of God is going to destroy the personality of the Divine. Is it?

Go into a great cathedral, as St.

Peter's or St. Paul's. As you look on these great pillars, on this great dome, this splendid architecture, you say: "I see here the fruit of the personality of Wren, or of Michael Angelo; and I am looking on something more than stone and mortar; I am looking on the work of a great mind and a great heart." But now imagine for one moment that as you stood there you could see stone reared upon stone, and column upon column; you could see some invisible hand tracing the fretwork around the columns and carving the beautiful forms; as you looked, the cathedral grew into its splendid proportions and then some invisible force lifted the great dome and put it like the dome of Heaven on the columns underneath. Would you think the personality was gone because it was operative before your eyes? Am I to think that there was a personal God 6,000 years ago, or 60,000 years ago, or 600,000 years ago, and that today, when I can go out and see Him painting the leaves and starting this fall the beginnings for next year's spring—see the love and life of the ever-present God at work before my eyes, can I think that His personality is gone? No; a thousand times nearer, a thousand times closer. We are in the presence of the great Divine personality. What we mean by personality is this: The Infinite and Eternal Energy, from which all things proceed, is an energy that thinks, that feels, that purposes and does, and is thinking and feeling and purposing and doing as a conscious life, of which ours is but a poor and broken reflection.

The image which in my childhood I formed of God as a great king sitting upon a great white throne was really an idol, though it was not made in stone nor painted upon canvas. It is not to such an imagination we are to go for our realization of the personality of God. God has personified himself in human history. He has entered into one human life and filled that life so full of Himself that in Jesus Christ we see the image of the invisible God. Christianity is not an episode. The life of Christ is not an historical event completed in three short years. Jesus Christ is the revelation of an Eternal Fact, and the Eternal Fact is the Ever Present God.

STRANGE ANIMAL FRIENDSHIPS.

ZOOLOGICAL GARDENS REPORT ODD INSTANCES OF COMPANIONSHIP.

Many and curious are the instances of animal friendships which one who has delved into the realms of natural history find for himself.

For instance, says a writer in the Philadelphia Public Ledger, the little pea-crab shares its food with the mussel in return for the protection of the latter's shell. It used to be supposed that the jellyfish seen along the mouth of the Thames river lived on the defenseless white shrimps sheltered underneath their long tentacles. On the contrary, the jellyfish floats along collecting food with its long arms, while the little shrimp remains in safe shelter and lives on the remnants. Taken from its

protection, the shrimp dies almost immediately.

The sea cucumbers also give shelter to a tiny salt-water fish, which, if not thus protected, would soon die. In a similar way the big Brazilian catfish saves another species from extinction by allowing them to live in his mouth.

A curious lizard, known as the tuatera, inhabits the Chickens islands, off New Zealand. It does not find much food for itself, but the petrel, which also lives there, gets plenty of fish. The lizard, however, is able to burrow, which the petrel cannot, so the two creatures, therefore, entered into a partnership mutually agreeable and advantageous, whereby the petrel nests in the lizard's burrow and the lizard obtains its food through the efforts of the petrel.

The remora or sucking fish is a sea animal which is said to live most completely by its wits. On top of its head it has developed a sucker, by means of which it attaches itself firmly to some big fish, such as a shark or whale, and is so towed in safety over the whole ocean, picking up lots of food on the way.

In the National Zoo of Washington, D. C., two Rhesus monkeys formed a warm friendship for a Belgian hare, which was reciprocated, and it was interesting to see the three trying to eat out of the same dish.

In the botanical gardens, Rio Janeiro, Brazil, a large manatee was kept several years ago in a pond on the grounds. It was an immense creature and it became so tame that it would often come up to the water's edge and eat grass out of the hands of visitors. An attachment, curious it may seem, sprang up between this strange creature and a European swan, and it followed the latter about as though it had been its guardian, and one had only to look for the swan in order to see where the manatee was lazily floating about and feeding on the water plants at the bottom of the pond. When the swan sometimes left the pond the manatee was restless and discontented until the return of its companion.

Mr. Aflalo, in describing some of the private menageries of England, writes of a number of such attachments in the big animal parks of Great Britain. At one place, Leonardslee, he saw a Sambur deer and a Welsh pony that chummed together in great shape. At the present writing a great hippopotamus in the London zoo has taken an interest in an ordinary black house cat and Tabby not only enters and leaves the quarters of the big brute at will, but takes a ride on his back occasionally. In another private menageric in Auckland Mr. Aflalo saw two gray wolves whose friendship for a large European bear was so excessively playful that it would cause the latter to climb a tree, where it would lie down to sleep in the forks of some branches, leaving the wolves howling below for his companionship.

Sir Henry Johnson, the discoverer of the okapi, in his recent volume of travels concerning Uganda, describes his experiments in the taming and domestication of the wild animals of that country and gives an illustration of the fondness that grew up between a baby elephant and a young zebra. The

little elephant would twine its trunk in loving embrace around the neck of the zebra and, although the latter was very fond of the elephant, there were times when it became tired and bored of its constant attentions and would bite the little fellow rather sharply with its great teeth, causing him to squeal under the pinch.

MEMORABLE SIEGE AND FALL OF PORT ARTHUR.

Nogi's main army was landed at Pitsewo and Port Adams, on both sides of the narrow neck north of the fortress, May 5, 1904, the railway to Liaoyang was cut and the move that was to seal Port Arthur was begun. On May 21 began the five days' fight that culminated in the bloody battle of Nanshan hill, May 26. The Russians were defeated, but at terrible cost, and Nogi, after occupying Dalny, planted a circle of Japanese guns around the outer ring of Port Arthur's forts. On May 27 the siege was fairly begun; with Togo's warships, lying like watch-dogs in the offing, the stronghold was cut off by land and sea. The opposing forces at this time were about 150,000 Japanese to about 50,000 Russians in the fortress.

THE DISASTER TO STACKELBERG.

Meantime Kuropatkin was urged to send re-enforcements south to the aid of the fortress, and Stackelberg, with a force of 30,000 men, started for the relief. He was intercepted by Gen. Oku, and the battle of Vafangow, one of the worst disasters the Russians had yet met, followed on June 14. That stopped the relief talk, and Stoessel and his heroes were left to their fate.

During June and July a number of the outlying forts were captured by Nogi, whose bombardment, although incessant and terrific, seemed to have no effect on the main defenses. Green and Wolf hills were taken and Takushan followed.

With the arrival of Marshal Oyama on the scene July 24, as commander-in-Chief of the mikado's armies, a message was sent to Stoessel demanding the surrender of the fortress or its capture by storm as the alternative. Stoessel refused and told the enemy to come on. In the assault that followed whole regiments of Japanese were wiped out. An attempt was made by the Russians to recapture Takushan, but it failed. Nogi's men held the hill 845 feet high, and their guns there protected to some extent their sapping operations against the inner forts.

DASH OF RUSSIAN FLEET.

On Aug. 10 came the sensational dash of the Russian fleet, when the entire squadron tried to escape, but Togo's fleet gave chase, and in a running battle Admiral Withoeft was killed on the flagship Czarevitch. That battleship, a wreck, put into Kinchou harbor; the Askold, badly battered, reached Shanghai; the Novik reached Saghalien island, where later it was sunk; several destroyers were lost in the fight, and the remainder of the ships, crippled and un-

seaworthy, reached Port Arthur, where they lay at anchor until destroyed or disabled later by Japanese land guns.

During August the fighting around the fortress was fast and furious. On the night of Aug. 24 the ranks of the Japanese were so decimated by the furious shrapnel fire of the Russians that they were forced to retire to the valley below the captured forts, and what might have been a successful general assault, with the capture of the fortified ridge east of Port Arthur, was converted by the Russian tactics into a repulse, redeemed in part by the wonderful fighting qualities of the Japanese infantry and their refusal to accept what seemed to be the inevitable.

From Aug. 19 to 24 the Japanese casualties were 14,000. The center division alone lost 6,000 and a single regiment lost 2,500. Only six officers and 200 men of this regiment were left after the fight. The retention of the Banjusan forts gave the Japanese a foothold on the fortified ridge as a result of six days of general assault. But the experiment was so costly it was not repeated.

DEPEND ON SAPPING AND DYNAMITE.

From this time onward, while fierce fighting at close quarters, bayonet charges and the use of hand explosives were frequent, the Japanese depended chiefly on sapping and dynamite to reduce the fortress.

The closing days of October brought notable successes to the besiegers, but they also met with serious reverses. On Oct. 28 they gained the countescarps of Rihlung and Sungshu forts and captured "P" fort between East Keekwan and Panlung mountains. They lost 2,000 men in this operation and were forced to abandon the positions.

November was marked by furious battles, the Japanese gaining ground almost inch by inch. On Nov. 5 and 6 the Japanese were repulsed in an attempt to carry Etse fort by storm. On the 13th the Russians in turn were repulsed in a sortie. On Nov. 26 the Japanese began a general assault on Rihlung, Sungshu and Keekwan forts, but although they reached the inside they were driven out with fearful loss.

SHIPS IN HARBOR DESTROYED.

On Dec. 6 came the capture of 203 Meter hill and its succeeding catastrophes to the Russian fleet. The hill overlooked every foot of Port Arthur and the harbor. From its crest Japanese officers were enabled to direct the fire of the heavy guns beyond with such unerring aim that the Russian ships at anchor in the harbor were rendered useless or sunk.

The destruction of the fleet was followed by the loss of the great forts north of the city, one by one. First Keekwan fort was captured. Then Rihlung fell on Dec. 28. On Saturday, Dec. 31, the Japanese captured the formidable stronghold on Sungshu mountain, and on Sunday, Jan. 1, the forts on Panlung and Wantai mountains were captured.

HEROISM AMOUNTED TO RECKLESSNESS.

The siege and defense of Port Arthur were marked by bravery, gallantry and desperation unequaled in modern war-

fare and hardly excelled in military history. Isolated instances of heroism that would have set the world ringing under less overwhelming circumstances were dwarfed by the generally magnificent conduct of both forces. By sea there were torpedo boat dashes of superb recklessness, and big ships plowed through mine fields with heroic disregard of life to give battle or in wild efforts to escape. By land the Japanese hurled themselves against the positions declared to be impregnable. They faced and scaled rocky heights crowned with batteries and crowded with defenders, suffering losses that military experts say would have appalled any European army.

STOESSEL'S STUBBORN DEFENSE.

In the doomed fortress its people lived under a devastating rain of shell and shrapnel. On scanty rations, besieged on every side, knowing that hope of succor or escape was vain, the garrison fought with a stubbornness that has evoked the admiration of the world. They met the untiring assaults of the Japanese with a grim valor that won even the praise of their foe, and the fighting was waged with a relentlessness that often refused truces to bury the dead and collect the wounded. Over corpse-filled trenches men fought hand to hand with cold steel and clubbed guns, and at short range hurled at each other hand grenades filled with high explosives. The whole story is one of undaunted courage and sublime bravery on the part of both armies.

STOESSEL'S OFFER TO SURRENDER.

At 5 o'clock Sunday afternoon of January 1, 1905, a Russian bearer of a flag of truce went into the first line of the Japanese position before Port Arthur and handed a letter to the mikado's officers, containing an offer of surrender, as follows:

"Judging by the general condition of the whole line of hostile positions held by you I find further resistance at Port Arthur useless, and for the purpose of preventing needless sacrifice of lives I propose to hold negotiations with reference to capitulation.

"Should you consent to the same you will please appoint commissioners for discussing the order and conditions regarding capitulation, and also appoint a place for such commissioners to meet the same appointed by me.

"I take this opportunity to convey to your excellency assurances of my respect.

"STOESSEL."

GENERAL NOGI'S ACCEPTANCE.

The Japanese acceptance was returned in the following words:

"I have the honor to reply to your proposal to hold negotiations regarding the conditions and order of capitulation. For this purpose I have appointed as commissioner Major-General Ijichi chief of staff of our army. He will be accompanied by some staff officers and civil officials. They will meet your commissioners January 2, noon, at Shuishiying. The commissioners of

both parties will be empowered to sign a convention for the eapitulation without waiting for ratification, and cause the same to take immediate effect.

"Authorization for such plenary powers shall be signed by the highest officer of both the negotiating parties, and the same shall be exchanged by the respective commissioners. I avail myself of this opportunity to convey to your excellency assurances of my respect.

"NOGI."

NOGI ENTERS CITADEL.

Headquarters of the Japanese Third Army Before Port Arthur, January 3, 3 A. M.—General Nogi and the Japanese army will march into Port Arthur this morning.

It is stated that there are 18,000 sick and wounded soldiers in Port Arthur. The hospitals, wrecked by Japanese shells, are unfit for use. Medieal and surgical supplies are exhausted. The condition of the wounded is deelared to be deplorable in the extreme. Many of the wounds have been bound up with hemp, there being no cotton or linen for bandages.

STOESSEL'S FINAL COUNCIL OF WAR.

Russian officers who accompanied General Stoessel's ehief of staff to Shuishiying give affecting descriptions of the incidents which accompanied General Stoessel's decision to surrender.

Sunday afternoon General Stoessel realized that his ammunition practically was exhausted and that unless he surrendered his men would be shot down without being able to resist.

Soon after noon on Sunday General Stoessel summoned a council of the superior officers, in which Admiral Wiren represented the navy. Shells shrieked incessantly overhead and around when the worn-out offieers gathered for the final conferenee in a dugout.

RUSSIAN GENERALS WEEP.

A Russian officer who elaims to have seen the meeting says it was most pathetic. More than one voice was choked with sobs as it assented to the inevitable. An agreement was soon rcaehed. It was to be "terms of honor or we die fighting."

Thereupon the remnant of the garrison was ordered to conecntrate where all the available stores had been colleeted, prepared to fight to the last unless General Nogi proved generous.

Admiral Wiren ordered measures taken to destroy his ships. Some of the forts were blown up and all possible was done while the messenger with the offer of surrender was on his way to General Nogi's headquarters.

SHIPS IN HARBOR DESTROYED.

In accordance with Admiral Wiren's orders the disabled battleship Sevastopol outside the harbor, was blown up, and the other large Russian ships inside the harbor were destroyed as thoroughly as possible. The half-sunken ships Retvizan, Poltava and Pallada caught fire as the other ships were blown up inside of and near the entrance to the harbor.

During the siege it is estimated that the Japanese lost more men than the total number of the fortress defenders.

RUSSIAN'S LOSS IN PORT ARTHUR.

Russia had invested in Port Arthur fortifications, according to their own estimates, not less than three hundred millions of dollars.

It is understood that they had about fifty thousand men in the Forts at the beginning of the siege. The loss of men is estimated to be above thirty thousand for Russia and fifty thousand for Japan.

MASSACRE AND RIOTS IN ST. PETERSBURG.

The working classes attempted to present a petition to the Czar on Sunday January, 22, 1905, and a hundred thousand or more assembled about the Winter Palace on the Neva. Cossack regiments were sent to disperse them, and in doing so, killed about two thousand and wounded five thousand more.

In writing of the cause of the great strike that brought on these revolutionary movements a noted Russian writer says:

"The simple truth is the Russian peasant, 100,000,000 of him, is, under present conditions, slowly starving to death. His average earnings in the central provinces are 17 and 18 copecks (8 to 9 cents) per day throughout the year; during the busiest harvest time they rise to an average of 27 to 36 copecks (13 to 16 cents a day); during the whole winter he and his family earn nothing. His diet consists of meal, flour and grits, cabbage and potatoes; no meat, excepting three times a year. His diet is insufficient, and less than in any civilized country. The hovel he lives in averages four yards long and not more than two yards high, harboring the whole family and whatever cattle he possesses. These data are taken from official sources.

"Is it a wonder that the Russian peasant has morally and physically degenerated? That the women are immoral, dreading maternity, and given to a frightful extent to infanticide? That the men are nomads, leaving wives and children for months, often years, trying to earn something in town or in far-away districts? That the recruiting in these central provinces shows progressively physical unfitness for the army? That the health of the women is bad, and that the rate of increase in the population in this 'black-earth belt' had dropped to 0.26, against 1.5 in the whole empire? Such despotism means relief through revolution."

JUL 22 1905

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